The Welding Engineer

Edited by L. B. Mackenzie

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HIGH PURITY OXYGEN

OXYGEN buyers should specify the percentage of purity in their contracts, and insist that deliveries are continuously up to specifications.

Airco high purity oxygen can be bought that way —Why buy oxygen any other way? — we prefer to sell it on that basis.

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72 Airco Distributing Points

Airco Apparatus Factories and Laboratories at Jersey City and Elizabethport, N. J.

ANYTHING and EVERYTHING for OXYACETYLENE WELDING and CUTTING

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You can profit

For Pipe Lines—Long or Short

A LARGE and long-established firm of engineers and heating contractors in Indianapolis says that they prefer welded joints "because a welded connection is as strong as the original uncut pipe, and because the welded portion can be made stronger than the rest of the pipe by building up the weld. . . . Welded connections have proved stronger, tighter, and more economical than screw connections."

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By this method L's, T's, and Y's are rapidly cut and joined. Furthermore, old pipe can be salvaged and used for these and countless other purposes. Any Oxweld fieldman can show you how.

YOU CAN PROFIT from the experience of big pipe line and public utility companies who have for years used the oxy-acetylene process in laying their pipe lines.

Pipe line companies adopted the oxy-acetylene method of constructing their lines because their own engineering tests and practical experience have proved that this is the most satisfactory and economical method.

The same methods are applicable to pipe lines of various kinds in your plant. Oxweld engineers and fieldmen can bring to you the result of years of experience in pipe line construction and can show you how to profit from this experience, whether you join a few lengths of pipe, or many hundreds. Send for free illustrated booklet on industrial pipe work.

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Thompson Ave. & Orton St.

San Francisco
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Oxweld

WELDING AND CUTTING APPARATUS

WORLD'S LARGEST MANUFACTURERS OF WELDING AND CUTTING EQUIPMENT

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New York, N. Y.

South Front and Girod Ave.
New Orleans, La.

71 Steuart St.
San Francisco, Calif.

Buyers' Index

Readers of The Welding Engineer will find this index to contain the most accurate information obtainable relating to welding apparatus and supplies. The advertising section includes the principal manufacturers of the United States.

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We not only do welding, but supervise the design and installation of oxy-acetylene welding plants; report on welding material and methods; make tests on welding apparatus for efficiency and economy.

Nine years' experience.

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See "Torches"

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Weldit Acetylene Co.

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Purox Co.
Imperial Brass Mfg. Co.
Weldit Acetylene Co.

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Truck of welded steel construction with roller bearing wheels. Unit is completely assembled and wired ready for immediate operation.

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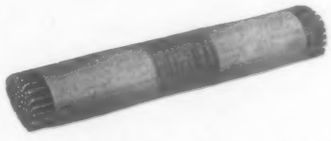

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Purox Co.
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Weldit Acetylene Co.

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International Oxygen Co.

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The Imperial Brass Mfg. Co.
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Alexander Milburn Co.
Purox Co.
Superior Oxy-Acetylene Machine Co.
Torchweld Equipment Co.
Welding Metals Mfg. Co.

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International Oxygen Co.
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Modern Engineering Co.
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Purox Co.
Superior Oxy-Acetylene Machine Co.
Torchweld Equipment Co.
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Purox Co.
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Harris Calorific Co.
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Modern Engineering Co.
Oxweld Acetylene Co.
Purox Co.
Superior Oxy-Acetylene Machine Co.
Torchweld Equipment Co.
United States Welding Co.
Welding Metals Mfg. Co.
Weldit Acetylene Co.

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Purox Co.
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Hauck Mfg. Co.
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The Imperial Brass Mfg. Co.
Oxweld Acetylene Co.
Purox Co.
Superior Oxy-Acetylene Machine Co
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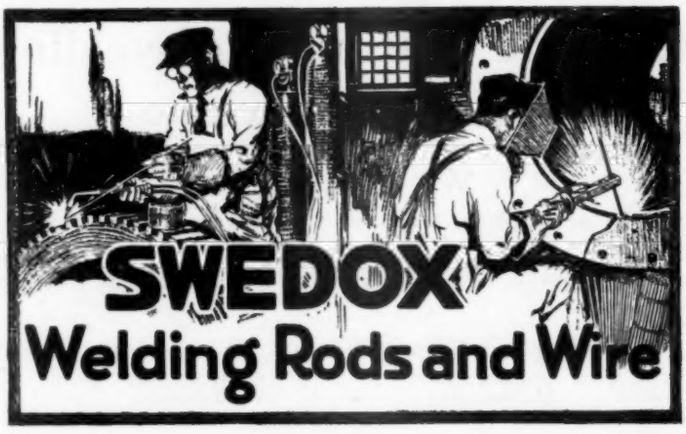

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ONLY OXYGEN REGULATOR

with super-sensitive expansion spring for welding, furnishing finer adjustment than individual regulators with external gauges.

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Welding pressure, Cutting pressure, Tank pressure on a single 3½ inch dial with two pointers.

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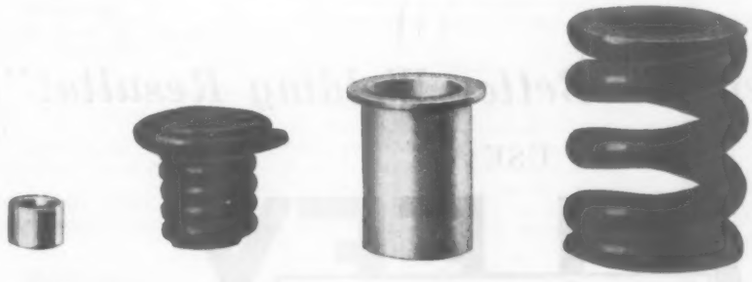

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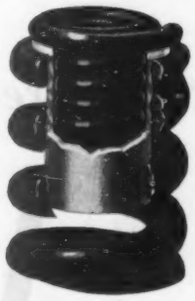

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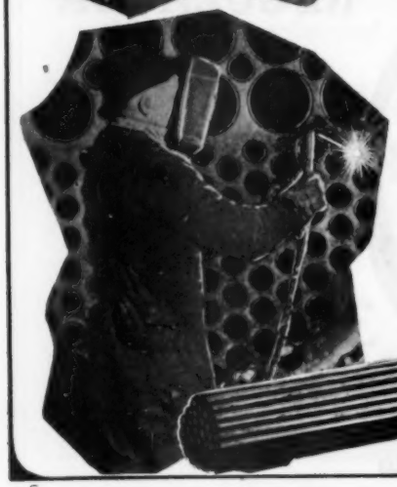

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Gas Products Association

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We furnish and will be glad to estimate on all kinds of brass and bronze castings.

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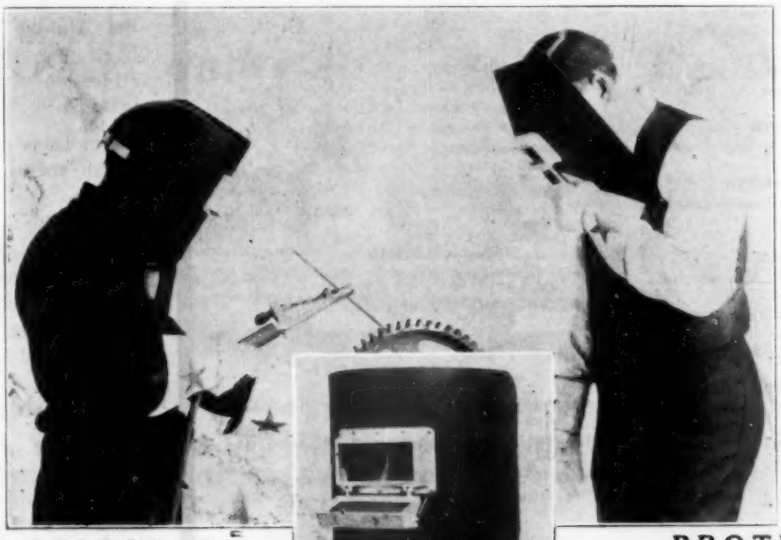
Every welder should use an IDEAL Welding Glove to protect his hands from heat and burns. Made of cape-skin leather, chrome tanned. This extracts all grease and makes it heat resisting and durable.



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Every welder should protect himself with an IDEAL Welding Apron. Made from selected, thick but light chrome leather. It has long life and wearing service as the leather so resists heat, tearing and cracking.

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Manufactured and Sold by

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Sound Welds can not be made with either Oxidizing or Carbonizing Flames.

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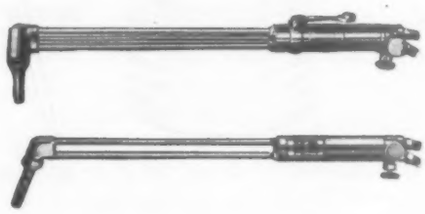

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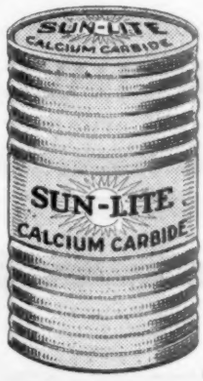

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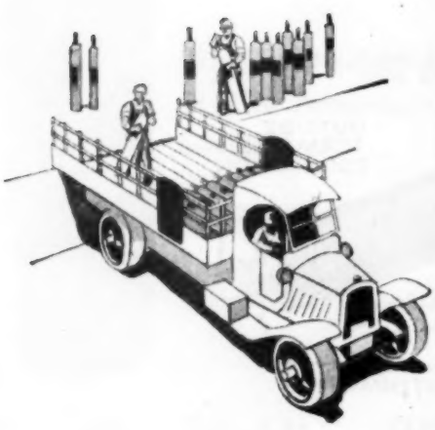

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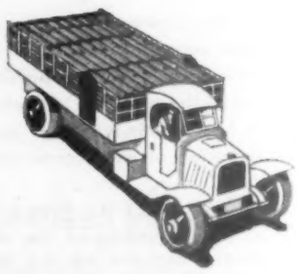

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Cutting Steel Underwater

Descriptions of Various Underwater Cutting Jobs Performed with Oxy-Electric Torch

By T. F. HAGGLUND*

DURING the years 1918 and 1919 considerable experimental work with underwater burning torches was done. Both gas and electric torches were tried and after months of failures, changes, and improvements, an oxy-electric torch proved itself reliable for underwater burning, though slower than the oxy-acetyline torch in air.

At first this torch was used exclusively by the Merritt &

58 Pound Lackawanna Steel Sheet Pile Cut at Depth of 35 Feet

Chapman, Derrick & Wrecking Company in connection with marine wrecking and salvage operations. However, during the past year the International Submarine Company has provided complete underwater burning outfits at various stations, namely: New York City; Philadelphia, Pa.; DeTour, Mich., and Quebec, Canada, and has trained a number of divers to operate the torch skillfully and efficiently.

During the spring of 1922 an exceptionally heavy flood swept down the Atchafalaya River carrying with it a huge timber fender pier containing about 120 ft. b. m. Forty miles down steam, while passing the Texas & Pacific Railroad bridge at Melville, this mass struck the corner of a sheet pile coffer-dam which had been placed as a pier reinforcement. The pier itself was undamaged but thirty steel sheet piles were bent down into the draw channel and formed an obstruction to navigation at low water.

Various methods of removing the bent and twisted section of the thirty interlocked piles were considered. It was deemed impractical to pull them either singly or collectively because of this distorted condition. Other methods were discarded because of the uncertainty of effective results and a subaqueous torch seemed to be the most efficient means of clearing the mass from the draw channel.

An underwater burning outfit together with diver-operator were shipped from New York. At New Orleans this outfit was transferred to a small river tow boat. This boat then proceeded to Melville, tied up alongside the bridge pier and furnished steam, throughout the job, for the small turbo-driven generator. Oxygen for the torch was furnished in tanks.

The diver then using the oxy-electric torch, cut the mass of twisted piling clear from the bridge pier, at a depth of 25 feet, and within a few inches of the original line of piles, thus permitting a new wall of steel piling to be driven around the pier. In all, 450 square inches of steel were burned through underwater.

Before this method was decided upon by the railroad engineers the lowest estimate for the work to be done by other methods was put at $35,000. The entire cost including rental of underwater burning equipment, tow-boat, diving, cost of transportation, etc., totaled only $5,500. In addition to this saving of $29,000 considerable time was saved.

At the same time this work was under way for the Texas & Pacific Railroad, another underwater burning outfit was being used by the American Pipe & Construction Company at Schenectady, N. Y., for similar work around one of the bridge piers of the new bridge near Schenectady. Here, when the construction work had been completed, 29 steel sheet piles, though under the water level, were above the fixed grade. These piles were cut down to the prescribed grade by a diver using the oxy-electric under water burning torch.

In February, 1923, at the Hammermill Paper Company's plant at Erie, Pa., a section of the 48-inch intake pipe was burned out under water and a valve connected in the line without the necessity of shutting down the plant or any loss of time. This pipe, however, was only ½-inch thick and the depth of water 12 feet.

During the spring of 1923 the underwater burning torch was used by the Merritt, Chapman & Scott Corporation on three operations:

1.—Burning holes for securing a patch on S. S. "West Calumb."

2.—Burning drain holes in the S. S. "Saqua" previous to pumping operations.

Piece of Cast Iron 32x26x1⅝ Inches Cut Out of 72 Inch Pipe at Depth of 50 Feet

3.—Burning free a heavy anchor wire fouled in the propeller of the S. S. "Hansa." In this last instance the underwater burning torch was resorted to only when a diver had tried without success for three days to remove the wire.

Submarine N-4

During the summer of 1923 the U. S. Navy Submarine N-4, an obsolete type, was sold for scrap. The work of dismantling started but before much progress was made the N-4 sank.

Various plans for raising were suggested and discussed. The weight of the sunken submarine was about 250 tons and the hoisting capacity of the largest floating derrick in the vicinity was only 80 tons. When other plans were rejected the following

*International Submarine Co., Inc., New York.

method was decided upon. This resolved itself into two distinct operations; namely, cutting the submarine into sections underwater and hoisting these sections by derrick.

An underwater burning outfit was installed on a small floating derrick and divers working from this derrick cut the hull into three sections and removed the conning tower from the midship section. Each piece then weighing less than 80 tons was hoisted by derrick and placed on the wharf for further scrapping.

Section of 42 Inch Pipe Cut Under Water

The underwater burning was done in the fore and aft battery compartments and the work was exeremely difficult owing to the heavy insulation in these compartments and the cramped quarters in which the diver had to work.

We believe that this job was the first attempt of cutting up

Cuts in Forward and Aft Ends Made at Depth of 25 Feet Midship Section of Submarine N-4 With Conning Tower Removed—

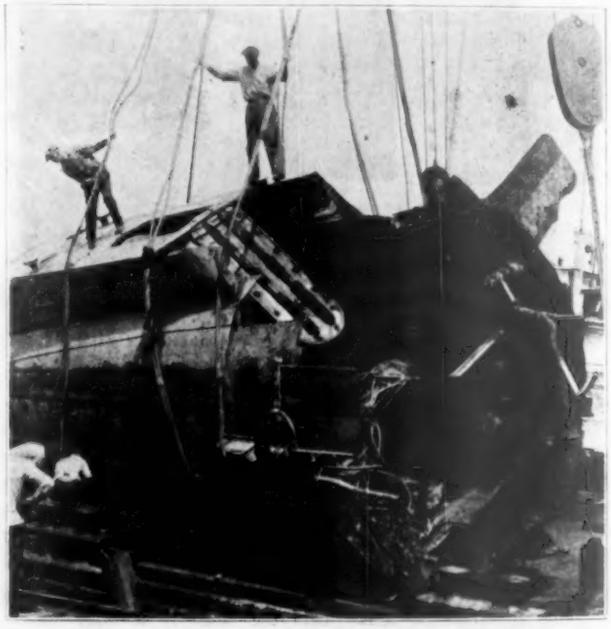
a wreck underwater, for the purpose of raising it without the use of dynamite. The accompanying photographs show the sections of the submarine and the cuts that were made underwater.

Cutting Manholes in Intake Pipe

Solvay Process Company obtains the water for its plant at Syracuse, N. Y., through a 72-inch cast iron intake pipe extending 1,200 feet out into the lake. Recently, they found that they could not obtain sufficient water, but as the pipe itself was large enough the trouble seemed to be that the pipe was filled with sand or refuse from the lake. They decided to have this pipe cleaned by divers. However, the only entrance to the pipe was at the extreme out-shore end or through the well near the shore line. This would mean that the divers would be obliged to work at points 600 to 700 feet from each end, and this was considered impractical.

It was then suggested that manholes at various points along the pipe be cut and that instead of the divers working from the ends of the pipe they enter and effect the cleaning through these manholes. The depth of the water over the pipe varied from 25 to 50 feet.

The International Submarine Company was then requested to furnish an underwater burning outfit and operator to accomplish the burning of these holes. The apparatus included a portable 50 Kw. generator which was shipped to Syracuse, and arrangements were made to have the Lake Towboat "Florence" furnish steam for the turbine-driven outfit. The oxygen for the work was obtained from tanks. This apparatus was installed on the



Bow Section of Submarine N-7 Showing Cut Made Underwater By Diver Using Oxy-Electric Torch

Towboat "Florence" June 11th and the underwater burning started on the 12th.

The diver first took down a weighted wooden template and located this at the top of the pipe where the hole was to be burned. Then a ground wire from the generator was attached to the pipe by means of a C clamp and the diver returned to the surface for the torch.

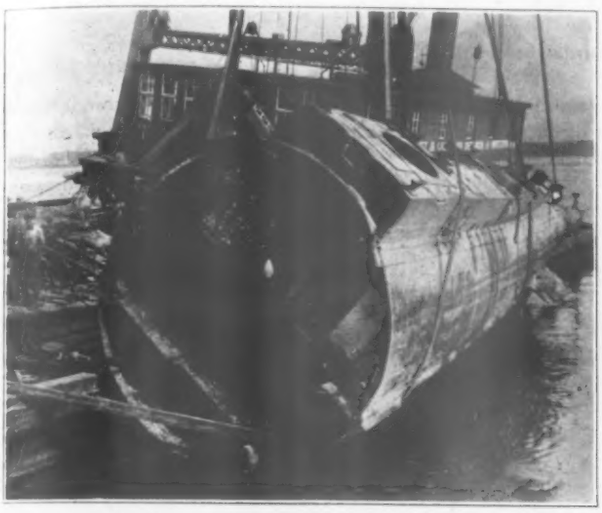
At this time it was noted that the diver's dress was covered with a thick brown oil and he reported that the pipe and the immediate inshore vicinity was also covered with it, and that only with difficulty could he maintain a position on the top of the pipe where the hole was to be burned.

At 9:40 the diver went down with the torch and burned until noon. In the afternoon he burned from 1:10 to 3 and at that time the tug "Florence" ran out of water. As the lake water could not be used in the boiler, work was suspended while the tug ran back to the Canal Terminal for a new supply.

As this tug was the only one available for the work an effort was made to install additional tanks on board so that water could

be carried for an eight-hour day. Two additional tanks were placed on deck, using all the available deck space, but even with this additional supply of water the boiler could not be used for more than five hours at a time.

Owing to the delay caused by the installation of water tanks



Stern Section of Submarine N-4 Showing Cut Made By Diver in 25 Feet of Water

on the tug, and the presence of oil all around the work which made it extremely difficult for the diver to hold a steady position and a steady arc, the first cut was not completed until June 20th. The second and third holes were burned in three days each. The fourth hole, however, owing to a delay caused by the inspection of and repairs necessary to the boiler of the "Florence" required four days; started June 29th and finished July 2nd. Divers then used these holes as entrances to the pipe and proceeded to clean the entire length.

In the meantime, the plates cut from the holes were fitted with a 5/8-inch iron plate overlaping the sides by 3 inches. A ring

Part of Coffer-Dam of 150 58-Pound Steel Sheet Piles Cut at Depth of 35 Feet

bolt was fastened in the center of this for hoisting and lowering and then, the original plate was returned to each hole as a cover. The outside water pressure together with the weight of the plate were sufficient to hold the covers securely in place. These manholes will be of great assistance for cleaning this pipe in the future.

Cutting Coffer-dam

When plans were made for the foundation work at the new Brooklyn Edison Sub-station at the foot of Hudson Avenue, Brooklyn, it was decided to drive a watertight coffer-dam of steel sheet piles along the water front. The foundation work could then be completed in the dry behind this dam. However, the major part of the coffer-dam was to be temporary and so arrangements were made to burn this sheet pile coffer-dam down to a depth of 35 feet upon the completion of the foundation. By cutting the sheet piles at this depth the base of the piles would remain intact and would prevent the river current from underscouring the concrete foundation.

During the early spring of 1924 divers using an oxy-electric torch burned through 150 50-pound Lackawanna steel sheet piles at the depth of 35 feet. In this work the divers were handicapped by cold weather, the presence of concrete in the interlock, and by the strong river current. The best day's work for one man was 10 piles cut.

REDUCTION IN FREIGHT RATE ON WELDING RODS

A saving of 25 per cent on welding rods is claimed to have been secured by the Traffic Manager of the Page Steel & Wire Co. By successfully presenting sufficient evidence and arguments to the Railroad Classification Committee the present ruling as shown in Supplement No. 16 of the Consolidated Freight Classification No. 3 was revised. Henceforth, all welding wire is now to take fourth class rate and the Official Classification Committee has advised that they will advise the Truck Line Inspection Bureau to this effect immediately.

As confirmation of this revision the Page Steel & Wire Co. has been advised by letter from Mr. Geo. H. Kelland of the Official Classification Committee as follows:

"Owing to the very great difficulty that has been encountered in defining 'an iron and steel rod' as compared with 'iron and steel wire' we have advised as follows: That if the shipments consist of iron or steel rods, plain or copper tipped, and are intended for transportation as iron or steel wire, they will be ratable as iron or steel wire."

As the matter now stands all welding material should be invoiced as welding wire and shipped out as straight and cut wire. This ruling applies to cast welding wire, both plain and coppered, and also to bare electrodes.

CORRECTION

On page 29 of the September issue of THE WELDING ENGINEER there appeared a news item entitled "New Purox Portable Gas Container." An erroneous impression is conveyed in this item as it states that the container maintains its vacuum through the fact that hydrogen will, when placed in a double walled flask, create a vacuum between the walls by freezing the air in that space in the form of a deposit on the inner wall. Although this is true the fact was not mentioned that the container is built on the Dewar principle and that, therefore, hydrogen has nothing to do with creating the vacuum. The vacuum in the first place is created by the use of an air pump and in the second place it is maintained and increased by the cooling of activated charcoal in the vacuum space when the liquid is introduced into the container.

STRAY CYLINDERS

The Compressed Manufacturers' Association, 120 W. 42nd St., New York City, is endeavoring to solve the problems of stray cylinders. Circulars of the American Railway Association and Bureau of Explosives have been sent out to all railroads to advise them to inform this association of any stray cylinders they may have on hand and cannot return to the owners. The association endeavors to act as a clearing house for stray cylinders, and should be assisted by all members.

The Linde Air Products Company plans the construction of a new plant at Houston, Texas.

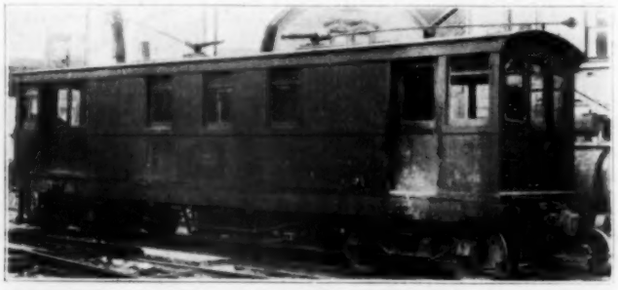
Special Car for Thermit Welding*

Proves Huge Success in Affording Shelter to Crew and Carrying Complete Working Equipment

By F. G. Hibbard†

FOR some time past it has been the idea of our welding foreman, Mr. Hilbert Stieglitz, that a special car equipped for the Thermit joint welding crew would materially increase the efficiency of this organization. The realization of this idea earned for him the first prize donated by the company for the best labor-saving suggestion.

In the spring of 1923 a car was available for this purpose and it was turned over to the Thermit welders with instructions to operate it for a short time to determine what interior arrangement would best suit their needs. The crew became enthusiastic over the proposition and soon plans were developed for the fitting out of the car in the following manner:



Special Car For Thermit Welding

On one side of the car a work bench equipped with a vise was installed in such a manner that it could be removed and a stove erected in its place to keep the car warm for winter work. This is followed by a molding bench with an opening in the center to store the mixture of sand and fire clay. This bench is equipped with a pneumatic sand rammer for making of the molds for Thermit joints. Next to the molding bench is a large tool box for sledges, lining bars, shovels, etc., with two cupboards above for the small tools. The balance of the room is used for the storage of preheaters.

Showing Inside of Thermit Welding Car

On the other side are lockers for men, next to a cupboard for oil cans under a desk for the foreman's records and reports. Adjoining this is a frame for mold boxes followed by an asbestos-lined rack for crucibles, leaving a space for the transportation of preheaters between this rack and the door.

In the front at one end there is a rack with compartments for inserts varying in thickness from ⅛ in. to 2 in., also two vertical square posts to carry the mold clamps. The space at the other end of the car is utilized for the storage of boxes of welding portions and bags of molding material.

Shelves are suspended under the roof on both sides, to hold about twelve sets of patterns.

The regular equipment includes one two-burner and two single burner preheaters, as well as a small truck with acetylene and oxygen tanks, together with the necessary gages, regulator and cutting torches. The accompanying photographs show clearly that by this compact arrangement there is ample room in the car.

Our car is equipped with air and an air rammer so that we can expedite the making of the molds. A molding bench in the car is a big improvement over a box placed on the side of the street. This molding bench is installed so that the mixture of sand and fireclay for the making of the molds is immediately below it; any excess sand falling back into the bin so that there is practically no loss of these materials.

Another Inside View of Thermit Welding Car

Equipment, such as mold boxes, clamps, patterns, inserts and tools, are all placed in racks or in cupboards provided for the purpose, so that they are not subjected to the misuse to which they were put by former methods when small tools and supplies, with no protection but a canvas cover, were often damaged and sometimes stolen.

Crucibles are now carried in a specially designed fireproof rack having a capacity for eight crucible pots, which is sufficient to run a day and night crew at any time. Fire clay and sand are carried in bags at one end of the car; in addition to that, in the bin underneath the molding bench, there is a capacity for fifteen bags. This car is more satisfactory to the men, for the reason that they have a locker for their clothes, they have a place to get dry in rainy weather and warm in cold weather, and they have a place to eat their lunch.

Before we had this car it was almost impossible for the night crew to find a place which would even shelter them during their lunch hour. In the winter time, when the car is equipped with a stove, the molding sand is kept dry and warm and molds can be made and taken directly from the car and placed on the rail joint to be welded, thus making it

(*Continued on Page* 40)

*Reactions—Metal and Thermit Corp.

†Construction Engineer, The Milwaukee Electric Railway and Light Co.

Dismantling Steel Gondolas

Modern Scrap Dock and Reclamation Plant Handles Twenty Cars Per Week

By C. J. Mackie*

THE Eola Scrap Dock has just recently been completed and here, under the supervision of the stores department, the C. B. & Q. Railroad has undertaken the wholesale scrapping of steel gondolas series 187,000. Eola has been chosen because this scrap dock has very unusual facilities for handling dismantling work. Space is ample and two large high speed gantry cranes have been placed in operation there. These large cranes cover and operate over a ground level dock 1600 ft. long and 105 ft. wide between the gantry rails.

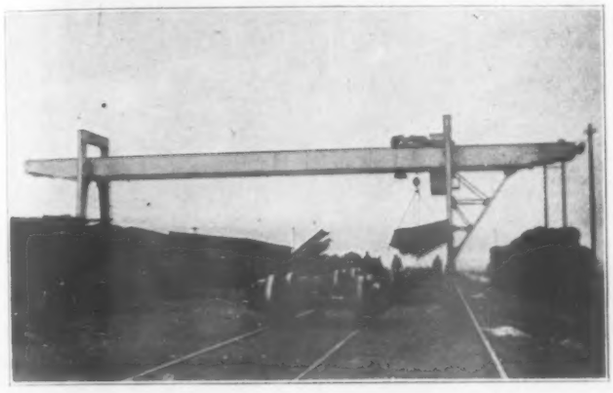


Fig. 1—General View of Dismantling Work

Fig. 2—Showing How Bodies of Cars Are Set Out Ten at a Time for Operator to Cut Up

In the first place, 300 steel gondolas were given over to the stores department for complete dismantling. They were to be cut up with the oxy-acetylene torch and scrapped. All of the material that was of any possible use was to be salvaged. This work was done and it was found that the total unit cost of scrapping these 300 steel gondolas amounted to slightly less than $16.00 per car. The C. B. & Q. considered this a very low figure and the complete data governing and covering the cost of dismantling 10 of these 187,000 series coal cars at the Eola reclamation plant are given here.

These figures are very complete and give one an insight into this entire dismantling operation. Let us now consider the facilities of the Eola Reclamation Plant and the reasons why it is a paying proposition to have this type of work done here.

As mentioned above, the two gantry cranes operate over a large area and afford very unusual facilities for lifting. That is why the management of the C. B. & Q. requested that the general storekeeper take over the dismantling of 1,000 worn out steel gondolas. These cars are now being dismantled and the scrap and salvage material being disposed of at the rate of 20 cars per week.

The large cranes make it possible to pile the trucks one on top of the other six high. In that way a great deal of space is conserved which helps greatly as it gives more working space under the area served by the gantry cranes. Another very good reason for carrying on the dismantling operation at Eola is that after the cars are dismantled, the various classes of scrap can be immediately loaded out in carload lots on sale orders, saving a great deal of extra handling and expense that would be incurred if cars were dismantled away from the scrap dock.

Fig. 3—Scrap Dock Crane Does the Heavy Work

Fig. 4—Side Sections Which Have Been Cut

Still another advantage of the Eola plant is the fact that the usable material salvaged from the worn out gondolas may be piled right on the spot so that it can be shipped out to the different points where it is needed without having to be handled frequently.

Store Keeper, C. B. & Q., Aurora, Illinois.

The operations used in this dismantling process have become very well developed, and the men are well trained. They are specialists in their work and the amount of time required for the different operations has been materially reduced thus causing a saving to be made in this direction.

The dismantling operation is carried on by a force of eight piece-workers. This force consists of seven workers and a working foreman. Two of the seven are trained in using the oxy-acetylene cutting torch. Two more men have specialized with one man rivet busters and two more of the men follow the rivet busters and separate the various car members. The seventh man sorts out the usable material for the magnet. In addition to this force of eight men there is a crane man and a ground man and a portion of their time is charged up to reclamation. Now to get to the process of reclamation.

Fig. 5—Entire Dismantling Job Is Done Within Reach of Crane

CARS AT EOLA RECLAMATION PLANT

First—Lifting car bodies from trucks and placing on dock using Crane.		
28 min. current for Crane @ $1.45 per hour	.68	
28 min. current for Crane @ .60 per hour	.28	
28 min. current for Crane @ .45 per hour	.21	$ 1.17
Second—Picking up trucks from dock and piling six high on ground.		
120 min. current for Crane @ $1.45 per hour	2.90	
120 min. current for Crane @ .60 per hour	1.20	
120 min. current for Crane @ .45 per hour	.90	
120 min. current for Crane @ .80 per hour	1.60	
		$ 6.60
Third—Picking up wheels from track and setting to dock.		
40 min. current for Crane @ $1.45 per hour	.97	
40 min. current for Crane @ .60 per hour	.40	
40 min. current for Crane @ .45 per hour	.30	
		$ 1.67
Fourth—Labor cost of cutting apart and stripping the body and trucks from good material.		
140 hours, piece work	$80.10	$80.10
Fifth—Oxygen and acetylene	51.37	$51.37
Sixth—Foreman 17½ hrs. Z-2 rate @ 10c per hour	1.75	$ 1.75
Grand Total		$142.66
Total cost per car		14.27
Seventh—Value of scrap sold	$ 748.94	
Value of good material reclaimed	2896.38	
Value of needing repair material	774.95	
		$4420.27
Cost of dismantling		142.66
Net saving for 10 cars		$4277.61
Net saving for 1 car		427.76

Ten cars are set on the ground at one time. Five of these are placed on each side of the scrap dock. The connections are then loosened and the body of the car is freed from the trucks. After this has been done one of the gantry cranes swings the car bodies to the floor of the dock. Here they are set upon by two acetylene torch operators, two one man rivet cutting gun operators and three scrappers who cut them apart.

After the cars are completely dismantled, the various classes of scrap are then separated and segregated according to the material which is altogether scrap material and material that can be reclaimed for further service. After the car bodies are removed from the trucks, the wheels are removed from the trucks and the truck frames stored by the cranes, for future use, in tiers six trucks high. The wheels that are found to be in serviceable condition are shipped to different repair tracks to apply to cars already in service. The wheels that are found to be in bad order are sent to the wheel press.

Fig. 6—Trucks Are Piled Six High to Conserve Space

The illustration, figure 7 shows how the car bodies are dismantled. The oxy-acetylene operators follow the lines, which are shown dotted, with their torches and cut the cars into different sections as is indicated.

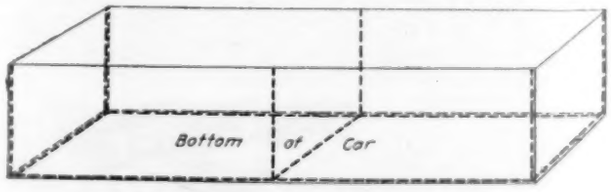


Fig. 7—Cars Are Cut Along Dotted Lines

Figure 1 is a general view of the Eola dismantling dock showing the cut members piled to the left, the trucks piled to the right and the gantry crane removing a car body from the trucks. It also shows one of the car bodies placed on the floor of the dock after the trucks have been removed. In figure 2 one can observe just how the gantry crane places the cars so that the operators can dismantle them and the dismantled material can be left right on the floor of the dock. Ten cars are set out in this manner at one time.

Figure 3 shows how easily this large gantry crane does the lifting work. It shows the trucks on the track and the car body swinging in the air ready to be taken to the proper place for the cutting up process. In figure 4 the side sections which have already been cut are shown piled up in the fore ground. One can also see how the crew operates and one of the car bodies being taken out to position.

The trucks are piled six high in a long row right inside the

(*Continued on Page* 40)

Concerning Eye Hazards

National Committee for Prevention of Blindness Reports "Cheaper to Prevent Eye Accidents than Pay for Them"

THE greatest possibilities for the elimination of the unnecessary eye hazards of industrial occupations lie in education—education of the state as to its moral and economic obligations; education of the employer as to the desirability, from his own point of view, of supplying adequate protection for the eyes of his employes; and education of the employe, particularly the old-fashioned and so-called hard boiled employe, as to the necessity of using that protection when it is provided."

This is the conclusion of the National Committee for the Prevention of Blindness, which recently made public its findings in a two years' study of the eye hazards in industrial occupations which extended into practically every industry and every State in the Union.

"While it is patent that safety cannot be legislated into an industrial plant," says the report of the Committee, a document of some 250 pages, "nevertheless it is futile to expect certain types of employers to give serious attention to the prevention of accidents, to the provision of proper lighting facilities, and to sanitation within their property if the state itself gives little attention to these matters. Some states do not yet require even the reporting of industrial accidents. Others require such reports, but make no effort to set up safety standards of lighting and sanitation codes for the guidance or observance of their industries notwithstanding the fact that it is now a simple matter for any state to obtain from the more progressive industrial states, from national trade associations and technical societies, from the United States Bureau of Standards, or from the American Engineering Standards Committee drafts of safety codes prepared by experts representing all interested parties and approved as national standards.

"The state's opportunities in this direction will not be fulfilled until legislators and administrative officials of every state recognize that the prevention of accidents is a moral and economic obligation of the state as well as of the individual employer. The State machinery best suited for the formulation and the administration of industrial safety regulations appears to be an industrial commission with full power to make and administer rules which may be varied from time to time to conform to changes in industrial conditions, rather than a code of laws which can be changed only by a legislature which meets once in two years and which is often influenced by political expediency."

Discussing the necessity for education of the employer, the National Committee says:

"Many employers of labor still need to be convinced that it is cheaper to prevent eye accidents than to pay for them; that it is false economy to use cheap goggles or to have a group of workmen share one pair of goggles; that the wearing of goggles or other head protection in dangerous operations should be made an absolute condition of employment. Fortunately, it is no longer necessary to resort to theoretical or academic arugments to convince the individual employer, for there are available records of the experience of numerous companies, statements of foremen, superintendents, managers, and plant owners, and any amount of authentic statistics to bear out each of these assertions.

"The owner or manager of an industrial property is naturally concerned primarily with the production of his commodity at the lowest possible cost consistent with the standard of quality that he has set out to maintain. Except in the comparatively few indusdustrial properties where safety has become a definite part of the general manufacturing process, the prevention of accidents and the protection of the health of workers are considered of secondary importance.

"The situation was most aptly described by C. P. Tolman when, as president of the National Safety Council, he said:

'Usually the engineer is required to make the plant as safe as possible with the following stipulations: he must do nothing which would decrease output or increase cost; he must not make changes of a character or in a manner to cause labor trouble; he must not make changes which will effect the character of the product; otherwise he has a free rein. This seems to leave little chance for accomplishment. But hundreds of engineers are doing effective safety work under just restrictions.'

"The result of this situation is that for every plant doing effective safety work a hundred are shirking their responsibility. Indeed few employers are giving serious attention to accidents—their cost, the possibility of preventing them, and the profits which can be made through such preventive work—as to the cost of labor, raw materials, and other items in the manufacturing process."

Under the heading "It is Cheaper to Prevent Accidents than to Pay for Them" the National Committee says:

"The report growing out of the survey of waste in industry, which was conducted by the Federated American Engineering Societies under the direction of Herbert Hoover, shows an estimated loss of 158,000,000 days as the result of non-fatal accidents occurring in industry in one year. On the extremely conservative estimate of $1.50 a day as the average compensation paid to workmen for time lost due to accidents, there is a loss to employers of $237,000,000 a year as the result of non-fatal accidents alone. It is conservatively estimated, also, that eye accidents constitute 10 per cent of all non-fatal industrial accidents. On the bases of these estimates it appears that the loss to industry through eye accidents is in excess of $23,000,000 yearly. No employer or industrial manager who is aware of these facts will question the assertion that it is cheaper to prevent eye accidents than to pay for them.

"In the case of the employe—particularly the older employe," the National Committee points out that "it is necessary to overcome the resistance against goggle wearing resulting from many years of working without such protection; it is necessary to overcome, in many cases, false pride and the belief that the wearing of goggles is an indication of cowardice or of approaching old age; it is necessary, most of all, to overcome the reluctance to try something new. The effort in this direction is necessarily divided into two phases: first , a year-round campaign for the prevention of eye accidents extending through the entire plan, and second, special efforts to sell the goggle idea to the hard-boiled, prejudiced, or old-fashioned workman. Here also it is no longer necessary to experiment, for there is available the experience of scores of industrial plants and of individual safety engineers who have given a great deal of study to the subject and who have had exceptional success in this particular type of accident prevention work."

Dedicated to

Louis B.

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an indestructible

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Arc Welding in Ship Building*

Use of Electric Arc in Various Construction and Repair Jobs Makes Savings Over Riveted Work

By A. G. Bissell†

IN SHIP construction and repair wherever two pieces of steel are to be united the union can be made by the use of the electric arc welding process cheaper, quicker and as strong as by any other method. The ease with which a steel deposit can be made to fuse into and unite steel members with little or no preliminary preparation makes this welding method of great assistance in the shipbuilding and repair yard.

The assembly of parts does not always progress without a hitch. There are times when an angle comes out of the shop that is either too short or too long. Fig. 1 shows the angle securing a bulkhead to a deck. This angle was too short,

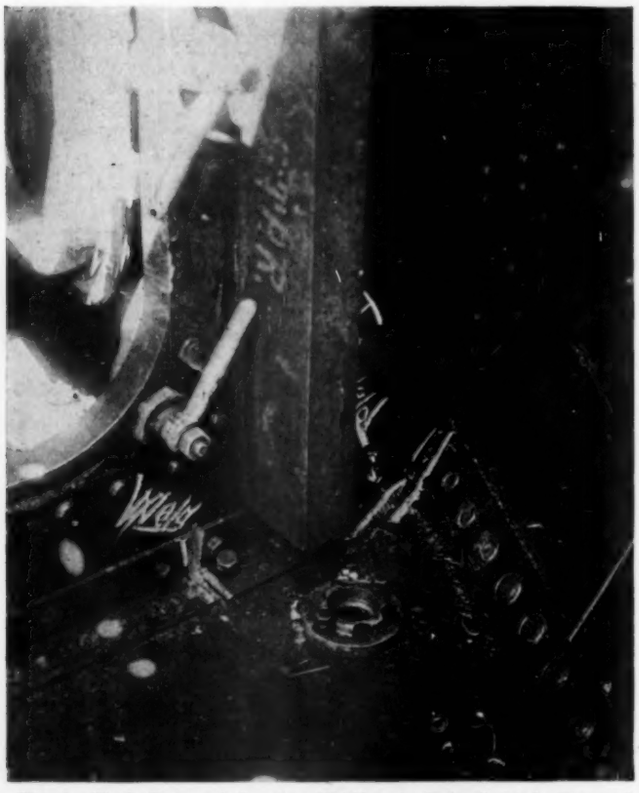

Fig. 1—Work Prepared for Arc Welding to Extend Angle Bar and Make Watertight Corner Joint

so a piece was cut to fit, set in place and prepared for arc welding. The pieces of angle are first riveted in place, then the joints indicated are united by the use of the electric arc.

Another place where the angle uniting the shell plate and a deck plate passes over a lap in the deck plate is shown in Fig. 2. In this case, to avoid joggling the angle, it is cut as shown so that the edge can be drawn flush with the deck on both sides of the lap. The butt joint between the angles is also shown as prepared for welding. Fig. 3 shows a similar location after a part of the welding has been completed and finished by the chipper and calker. More welding is to be done at each end of the finished section indicated by the chalk marks.

Reprinted through courtesy of Marine Engineering and Shipping Age.

†*General engineering department, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.*

Skylight Construction

The use of arc welding in place of riveting is well demonstrated in Fig. 4, which shows an engine room skylight in

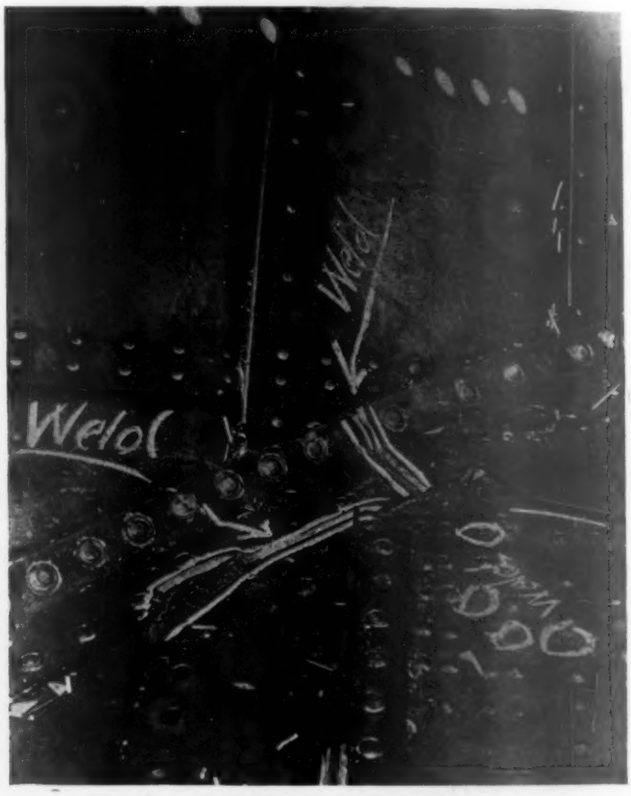

Fig. 2—Use of Arc Welding to Join Two Angles and to Eliminate Joggling of Angle

the course of construction. The structure in this case was completely bolted together by widely spaced bolts before welding. In welding these skylights they were well supported and perfectly lined up before welding. While welding it was found

Fig. 3—Similar Job as Shown in Fig. 2, Showing Work Partially Completed

desirable to weld about a 6-inch seam then skip a foot or two and weld 6 inches more, in this way avoiding overheating the

surrounding metal and warping the structure. It was found desirable to leave the bounding bar unwelded until after the skylight had been set in place on the ship in order that the angle might be made to conform to any irregularities in the deck. After this angle was secured to the deck, the fillet weld between the toe of the angle and the side of the skylight was made and the bolt holes filled. Where the skylight is not to be

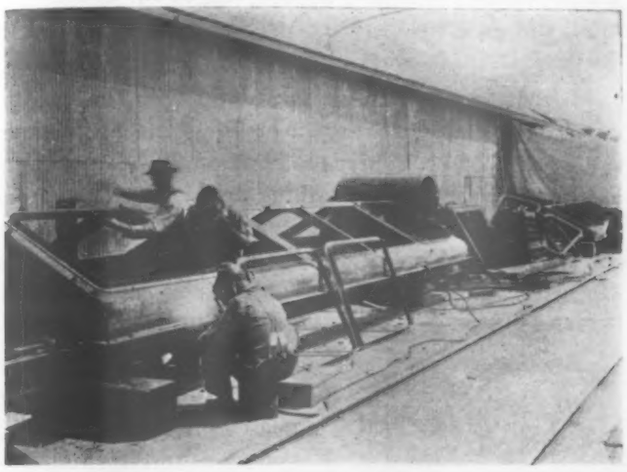

Fig. 4—Arc Welder Assembling a Skylight

portable it is welded directly to the deck. Many changes may be made in the design of these skylights, eliminating the angles and substituting flat bars.

In the construction of funnels, arc welding can be used and the necessity of punching, reaming and riveting eliminated. By

Fig. 5—Rudder Frame Lined Up for Preliminary Tacking

assembling the funnel on a rack the necessity of bolting can be avoided. The omission of laps gives a smooth job with a slight reduction in weight. Funnels made by this method will remain smoke and gas tight and have a much better appearance than riveted funnels. Smoke uptakes also may be assembled by arc welding.

Built-Up Rudder Frames

The use of arc welding in uniting heavy steel members is very successful, if it is properly done. In the construction of six built-up rudder frames the process was used with great success. Some difficulties were encountered before the correct procedure was established but when these were overcome a very good job resulted. The methods of welding adopted in the construction of these rudder frames may be applied to any welding where more than one layer of deposited metal is required.

These rudder frames consisted of a stock 20 feet 1 inch long and eight arms ranging from 1 foot 11 inches to 5 feet 9 inches long. These parts were forged from medium steel. The arms were beveled at the ends to form a 45-degree angle on each side with the rudder stock and the bearing surfaces on the stock were all machined before the arms were attached.

The parts were prepared for welding by first removing all scale and dirt from the surfaces to be united. This was quickly done with a roughing tool and a pneumatic hammer. The parts were then lined up on a rack as shown in Fig. 5. While in this position the arms were temporarily secured to the stock by means of metal straps welded to the arms and stock. When this was done the whole structure was picked up by a crane and placed in the position shown in Fig. 6 to give the welder access to both sides of the cut. When the arms on one side of the frame were completely welded, the frame was turned over and the arms on the other side were completed.

It was found that to obtain the best results on this class of heavy welding it was necessary to deposit the weld metal in rows of beads to form a layer of metal on the surfaces to be united. A

Fig. 6—Completed Rudder Frame in Position in Which Welding Was Done

layer was deposited on one side then one was deposited on the other. Each layer was well peened with a pneumatic-hammer before the next was applied. Fig. 7 shows diagrammatically the method of doing this welding. By this method the peening stretches the deposited metal, removing the cooling strains while the heat of the fusion of the next layer removes the effect of the cold working and to a slight extent anneals the metal.

Savings Effected

In the welding of these rudder frames an average of 200 pounds of electrode metal were used on each one and twenty-

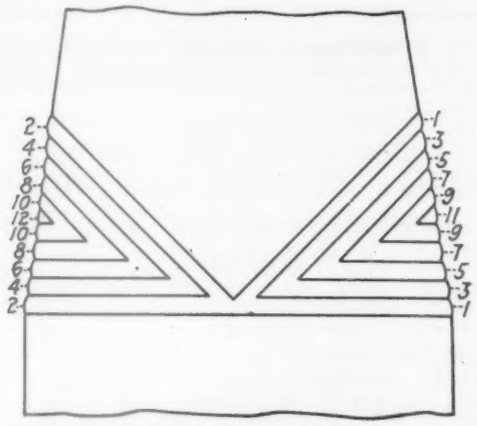

Fig. 7—Diagram Showing Method of Depositing Layers of Weld Metal in Welding Rudder Frames

five man-days were required to do the work. The cost of the completed rudders, one of which is shown in Fig. 8, averaged $1,950 each, of which $290 was for welding.

The saving in this cost of construction is evident when

(*Continued on Page* 32)

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Louis Burton Mackenzie

1880-1924

LOUIS BURTON MACKENZIE, Editor of The Welding Engineer, died at the South Shore Hospital, Chicago, on October 6th, following an attack of pneumonia. He was 44 years old.

Mr. Mackenzie became identified with the welding industry by his establishment of The Welding Engineer in January, 1916. Prior to this, he had been engaged in the publication of various trade papers, among them Railway Signal Engineer, Railway Electrical Engineer, Illinois Central Employees Magazine, Modern Machinery and The Office Outfitter.

Probably no man in the industry was better known, and certainly none more beloved. He brought to the welding industry a thorough knowledge of trade paper publishing, and by his strong personality, honesty, and fairness, gave the welding field a common meeting place.

His activities in the American Welding Society, International Acetylene Association, Gas Products Association, and Compressed Gas Manufacturers Association are well known. He will be sorely missed at the future meetings of these societies.

He has left behind two monuments of his interest in the welding industry, The Welding Engineer and The Welding Encyclopedia.

Mr. Mackenzie was born at Richmond, Michigan, March 3rd, 1880. He matriculated at the University of Michigan, where he was prominent in athletics. He was a student at Ann Arbor at the outbreak of the Spanish-American War, and left the University to become a volunteer soldier in the service of his country

He was familiarly and lovingly known as "Mac" to everyone with whom he came in contact. He was of Scotch ancestry and proud of it, of his football activities in his college days, and of his service to his country in 1898. His keen sense of humor will long be remembered by those who knew him.

He is survived by his wife, Gertrude Hungerford Mackenzie, son Kenneth Burton Mackenzie, and daughter, Margaret Jean Mackenzie.

(Signed) M. Keith Dunham.

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ARC WELDING IN SHIP BUILDING

(*Continued from Page* 29)

this cost is compared with the cost of a rudder having the arms forged on and the cost of a cast steel rudder.

Cost of rudder having arms forged to stock	$2,247
Cost of cast steel rudder	$3,175
Cost of rudder having arms arc welded to stock	$1,950

These figures were compiled in 1920.

Tank Work

Steel tanks of all kinds may be assembled by arc welding. These tanks are superior to riveted tanks in that they are lighter

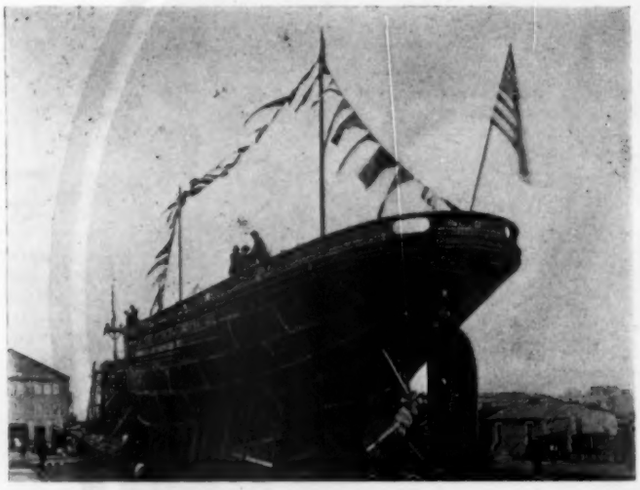

Fig. 8—Completed Rudder in Place on Tug Just Before Launching

and stronger for a given thickness of plate. The recent tests on non-fired welded pressure vessels conducted at the Bureau of Standards has demonstrated that a properly conducted arc welded tank is equal to any other. Fig. 9 shows two tanks constructed by arc welding for ship use. These tanks were made by rolling the steel sheet into a cylinder having a joggled lap joint which was welded on both lapping ends. The splash plates, heads, manhole reinforcing ring and fitting were all arc welded. Where pipes were to be attached, a ¼-inch plate was welded to the head, then drilled and tapped to receive the pipe. This eliminated the use of packing, which would have been necessary had a flange been bolted on. Intricate shaped tanks may be assembled more easily by welding than by riveting, and all angles

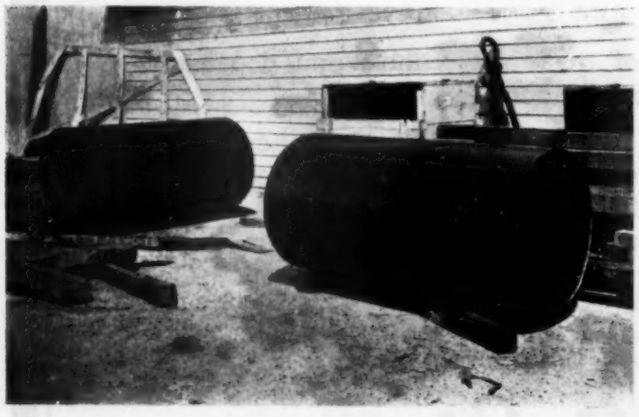

Fig. 9—Arc Welded Tanks for Use on Board Ship

and in most cases all laps eliminated, giving a reduction in weight which is a desirable feature in ship construction.

The saving in labor and material by the use of the arc welding process is evident in the construction of several sea water evaporators by arc welding and by riveting. These evaporators were of 2,750 gallons capacity and were all to be used for the same service. The shells and tops of these evaporators were made of 7/16-inch steel and the bottoms of ⅞-inch steel. In those that were riveted two hundred and eighty-eight ⅞-inch rivets were driven. Flanging and lapping were eliminated in the welded evaporators resulting in a reduction of 330 pounds in the weight. In comparing the cost of labor required to build these evaporators, the arc welded evaporators cost 35 per cent less than the riveted evaporator. Figs. 10 and 11 show an evaporator of each type.

Weight of riveted evaporator	1,630 pounds
Weight of welded evaporator	1,300 pounds
Difference	330 pounds
Direct labor cost, riveted evaporator	$191.43
Direct labor cost, welded evaporator	124.65
Difference	$ 66.78

Bilge Keels

The installation of bilge keels has been very successfully accomplished by electric arc welding. By using this method there is an enormous saving in time and material over riveting. In

Fig. 10—2,750-Gallon Arc Welded Evaporator

riveting it is necessary to secure two angles or a "T" bar to the shell of the ship to hold the keel plate. This requires the punching of these angles and the plate in the shop. Where the angles pass over a lap in the ship plating, they must be joggled or liners inserted. For every rivet driven through the shell a hole must be drilled and the rivet calked. Every tank that is pierced must be tested after the job is completed.

Fig 11—2,750-Gallon Riveted Evaporator

In attaching a bilge keel by arc welding, the line is located on the bilge of the ship and the plate metal scaled and cleaned of dirt and rust for about 3 inches each side of the line. Sup-

(*Continued on Page* 40)

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GENERAL ELECTRIC

Pipe Joint Patterns

Patterns for Welded Joints Save Time and Money—Easy to Make—Adaptable for All Bends, Tees and Ells

By E. Miller

EVERYONE realizes the advantage of having definite plans to follow, no matter what one is doing. This is especially true when cutting out material for a job. The purpose of this article is to treat the subject from the welder's standpoint and the following is the writer's personal experience in a plant where all pipe lines, which varied in size from 1¼ inches to 12 inches, were welded at all joints wherever practical.

Size of Pipe in Inches	Outside Diam. of F.W. Pipe	No. of divisons of circle	Circumference or Dimension CC
1¼	1.66	12	5.215
1½	1.9	12	5.97
2	2.38	12	7.46
2½	2.88	12	9.03
3	3.5	12	11.00
4	4.5	12	14.14
5	5.56	12	17.5
6	6.625	12	20.8
7	7.625	12	24.0
8	8.625	16	27.0
10	10.75	16	33.8
12	12.75	16	40.0

TABLE 1.

How to Go About Pattern Making.

The overhauling period of the year was at hand and the management decided to increase the size of all mains and arrange them differently than the old ones. A crew of welders was called in and started to work welding up the large mains. The joints in straight lengths were easily handled, but when it came to making a 90 degree bend, such as shown in Figure 2, much time was lost.

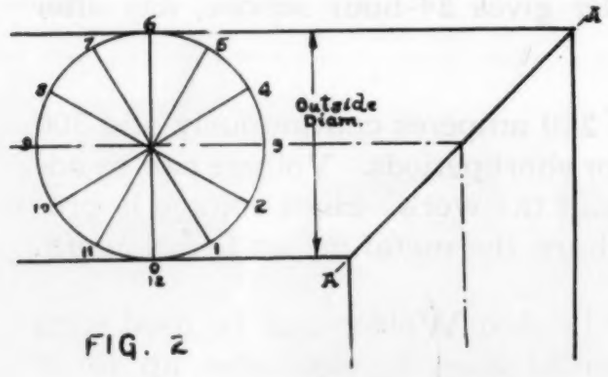

FIG. 2

How 90 Degree Bend Patterns Are Made.

The welders would cut the two pipes on a 45 degrees angle and butt them together. They wouldn't fit! Of course not! They would then mark the places and take off a little here and there with the torch until it did fit, and then proceed with welding the joint. This meant a waste of time and material.

The writer was called on to make a pattern which could be wrapped around the pipe, and the cutting line marked off so that when the pipe was cut and placed in position for welding, no further trimming would be necessary. The pattern was a success and proved to be such a time saver that a complete set of patterns, covering all sizes of pipe from 1¼ inches to 12 inches, for 90 degree bends, 45 degree bends and tees was made up. For every other connection, such as a nipple welded into a header, a pattern was made.

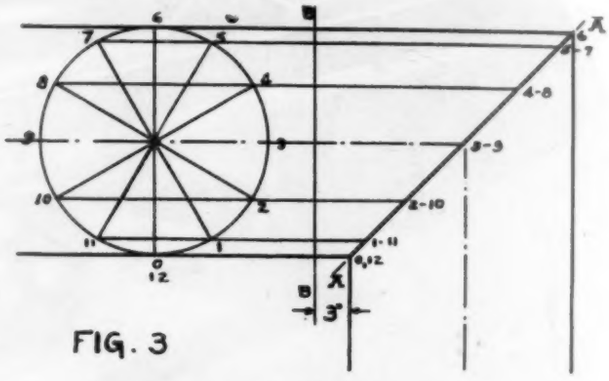

FIG. 3

Second Step in Making Pattern.

The material necessary for making one of these patterns consists of a straight-edge, an angle, a compass, a rule, and a piece of heavy paper, and a pencil.

Assuming the problem is to make a pattern for a 90 degree bend, as in Figure 2, one proceeds as follows: First, lay off the joint full size or actual size, letting the lines represent the outside diameter of the pipes.

Table 1 will be found useful in making up these patterns. Then inscribe a circle and divide it into twelve equal parts and number the parts beginning with zero. For large size pipe the number of divisions should be increased as is given in Table 1.

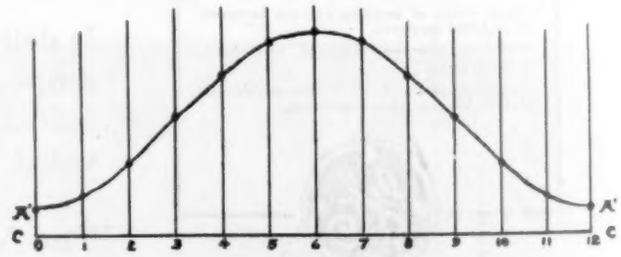

FIG. 4

Line CC Represents Circumference of Circle.

Now extend these points over to the line A A and number the intersections to correspond with the points of the circle as in Figure 3. Then draw the line B B at right angles to the diameter starting it 3 inches from the corner. This completes the preliminary details prior to making the actual pattern.

Now proceed to lay off a line C C which represents the circumference of the circle as in Figure 4. The length of this line can be taken from the last column of Table 1. Divide this line

This weld

Note first that it is made with a G-E Automatic Electric Welder.

On this metal

Note secondly that this continuous electric weld is on galvanized iron.

Is made with this electrode

Note also that this combination of flux, core and sheath, constituting

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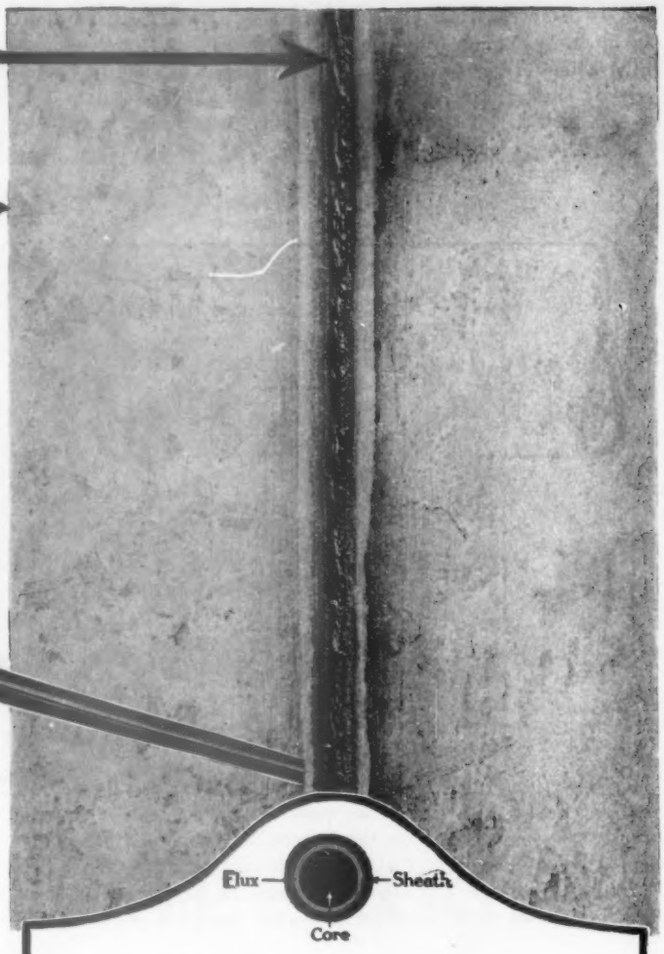

Magnified cross section of G-E Welding Electrode

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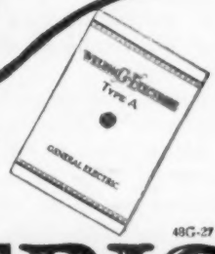

This booklet (Y-2019) tells all about G-E Welding Electrode. Ask nearest special distributor for a copy.

MERCHANDISE DEPARTMENT

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into as many equal parts as the circle was divided into and number them beginning from the left with zero. At each division draw a line at right angles to C C. Starting at 0, lay off on the vertical line a length equal to B-0, on line 1 lay off length B-1, on line 2, B-2, and so on until B-12 is laid off which is equal to B-0. Now join the extremities of these lines and the result will be a curve A′A′ which corresponds to the line A A in Figure 3. Now proceed to cut the pattern out by cutting along the edges C A′, A′A′, A′C, C C. The pattern is now complete.

Now proceed to wrap the pattern around the pipe, hold the pattern in position with one hand and with the other mark on the pipe with soap-stone or red lead the line A′A′. This will be the cutting edge. Cutting the two pieces of pipe on the line A′A′ and butting them together will result in a 90 degree bend which will require no trimming. The welder can then weld the joint.

The procedure as outlined above can be applied to any sort of a pipe joint. If, for instance, a pattern for a tee is to be made, the joint is laid out as in Figure 5. The pattern is to be wrapped around the outlet of the tee, so the circle is inscribed in the outlet and not in the run. The difference between this pattern and the one outlined for the ell is that the cutting line, A A, is half of a circle instead of a straight line. After the outlet is cut along the edge A′A′ on the pattern, it is placed in position on the run and the outline marked and cut; the outlet serving as a pattern to cut the run.

There were many special joints to make at this plant and for each one a pattern was made; for example, the outlet welded into a separator on a tangent as in Figure 8. The procedure for making the pattern is the same as for the ell with one exception, and that is in the cutting line A A, which has the curvature of the outside of the separator, as in Figure 9. The pattern as in Figure 10 results.

It is surprising the small amount of time required to make a pattern after two or three have been made. The main thing to bear in mind is that the lines must represent the outside diameters, the reason is obvious. The value of these patterns can not be overestimated when considering the saving in time and material. They should be made a part of the welder's equipment in every plant where pipe lines are welded.

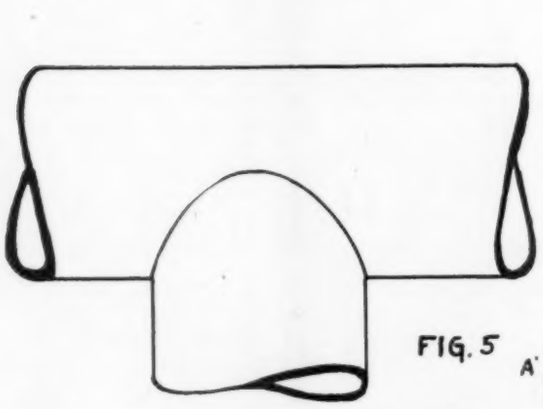

FIG. 5

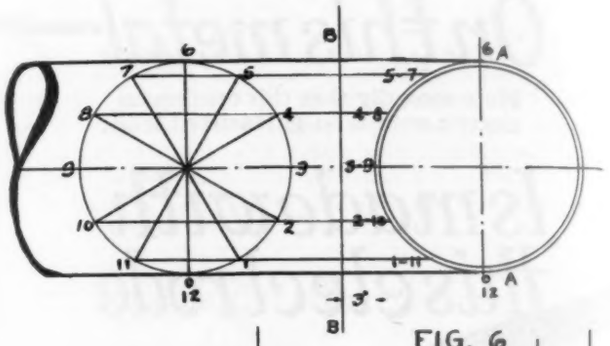

FIG. 6

FIG. 7

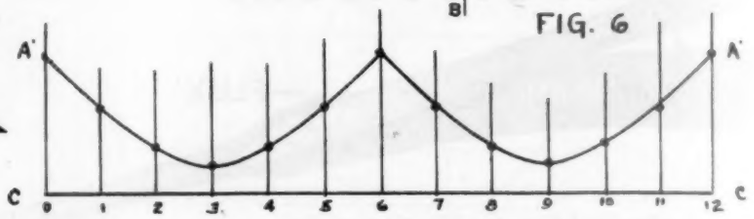

Fig. 5—Pattern for a "Tee." Fig. 6 and Fig. 7 Show This Application.

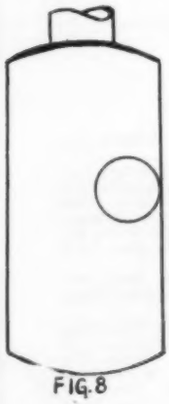

FIG. 8

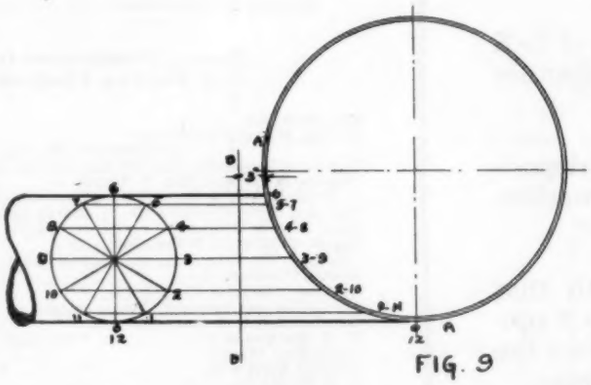

FIG. 9

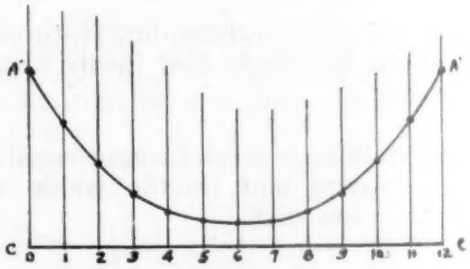

FIG. 10

Fig. 8—Pattern for Welding at a Tangent. Fig. 9 and Fig. 10 Show This Application.

NEW QUARTERS FOR MOREY FLUX & CHEMICAL COMPANY, INC.

For the purpose of securing better shipping facilities and to assist materially in making deliveries brought about by increased demands, the Morey Flux & Chemical Co., Inc., are removing their laboratories from Parkesburg, Pa., to 1813 Williamson St., Wilmington, Delaware.

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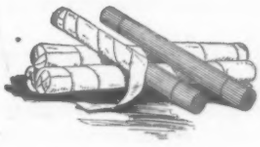

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Spot Welding*

Variance of Pressure and Flow of Current Characterize Different Types of Automatic Welders

SPOT welding is done on two principal types of welders.

The first type consists of welders, either hand or foot operated, in which the character and quality of the welds are dependent upon the judgment and skill of the operator.

The second type consists of welders, generally but not always power operated, in which the character and quality of the welds are independent of the judgment and skill of the operator. Such welders are generally termed automatic or semi-automatic welders. These automatic types of welders are again divided into three types.

The first type of automatic spot welder consists of machines in which the pressure is fixed by adjustment and the duration of flow of the current is controlled by a timing cam or its equivalent.

The second type of automatic spot welder consists of a machine in which the pressure is fixed by adjustment and the amount of amperage of the current is also fixed by adjustment, so that when the amperage reaches a predetermined value the circuit is broken and the welding stops.

The third type of automatic spot welder consists of a machine in which the pressure is fixed by adjustment and the current is cut off by the movement of the electrodes through a predetermined distance. This movement of the electrodes is brought about through the softening of the heated area and its yielding to the applied pressure. This method has been standard for years for automatic butt welding machines.

A large spot welder has been built for use in ship fabrication which has a 6-ft. gap and is designed with capacity to weld two ¾-in. plates. It provides a pneumatic pressure of 60,000 lb. and a current of 50,000 amp. and welds simultaneously two spots, each of some 1½-in. diameter in a few seconds. In this welder, known as the "Duplex Welder," two spots are simultaneously welded, the current crossing the plate in one direction between two electrodes and then back again between two other electrodes. Two transformers, one located on each side of the plates, are comprised in the outfit. The chief object of this duplex feature is to eliminate the large reactance drop of a conducting loop some 6 ft. in length and 1 ft. wide when traversed by some 50,000 amp. of 60-cycle current.

The character of spot welds made in practice varies all the way from a mere surface adhesion which resembles a soldered joint, to a thorough weld and full diameter of the electrode point and of such strength that when the plates are torn apart large portions of the metal of the one or the other of the plates are torn out.

The surface adhesion weld mentioned above, which is known to the trade as a "stick weld," is employed very extensively in the trade for securing the edges of very thin material, about .015 in. thick, in the form of a lap seam. Welds of this character on thin material are made at the rate of 120 to 150 welds per minute on a hand-operated machine, and there is practically no indentation of the work by the electrodes.

In order to obtain a real weld on sheets .020 in. thick or thicker, the metal between the points of the electrodes must be compressed to such an extent that a depression will be made on the outside surfaces by the electrode points.

When such a depression is detrimental to the appearance of the work it can be eliminated from one of the surfaces by using against that surface an electrode having a large flat surface instead of being pointed. A pointed electrode must be used, however, against the other surface.

Spot welds are made under three distinct methods, according to the work and the machines at hand.

The first method employs comparatively light pressure at the start, so as to get considerable resistance and consequently greater heating at the adjacent surfaces of the plates, followed by heavy pressure to complete the weld after the temperature has reached the proper point.

The second method is the same as the first, except that the current is made to flow at short and frequent intervals instead of flowing constantly during the period of heating.

The third method employs heavy pressure for making the weld at the start and is continued to the finish of the weld, and the current flow is continuous. For plates of the same thickness, the third method requires a welder of much greater electrical capacity than required for either of the first or second method.

Ferrous Metals, Low Carbon, Plates Equal Thickness

Use either of the three methods—Third method preferable.

Ferrous Metals, Low Carbon, Plates Unequal Thickness

Use either of the three methods—Third method preferable.

Ferrous Metals, High Carbon, Plates Either Equal or Unequal Thickness

Any one of the above methods may be used, but the results will differ. The third method will produce perfect welds, but they will be very hard and very brittle, requiring heat treating to be of any practical value.

The second method, if property executed, will produce welds much less brittle, but will tend to cause buckling of the plates.

The spot welding of high carbon steel plates cannot be so broadly used in actual manufacturing as the spot welding of low carbon plates because of the difficulty of eliminating the brittleness of the welds. This brittleness can be very much reduced, if not entirely eliminated, by adjusting the pressure and secondary voltage so as to cause the heat to run back into the plates for area of about sixteen times the area of the actual weld. This, however, will cause buckling of the plates if there are several welds in close proximity.

Non-Ferrous Metals

The third method produces the best results on metals of this character.

In spot welding, like butt welding, there are many special features employed to obtain welds where conditions are such that standard practice alone will not produce satisfactory results. Some of these features are as follows:

Placing a thin steel disk about the diameter of the electrode points between the plates to be welded, at the location of the desired weld.

Forming projections on one or both the plates at the location of the desired welds. These projections to come against the surface of the other plate when the plates are in position for welding.

The above features are generally resorted to when the plates are of a thickness greater than the capacity of the welder under normal methods.

Successful spot welds have been made on material ranging from 0.002 in. to 1 in. thick. When the plates reach ⅜-in. thickness the amount of power required, both electrical and mechanical, begins to increase very rapidly and especially after two or three welds have been made within 4 or 5 in. of each other. In order to get satisfactory welds on three plates, each ½-in. thick, the welds 5 in. apart, it was necessary to use 400 kw. and 7 tons' pressure.

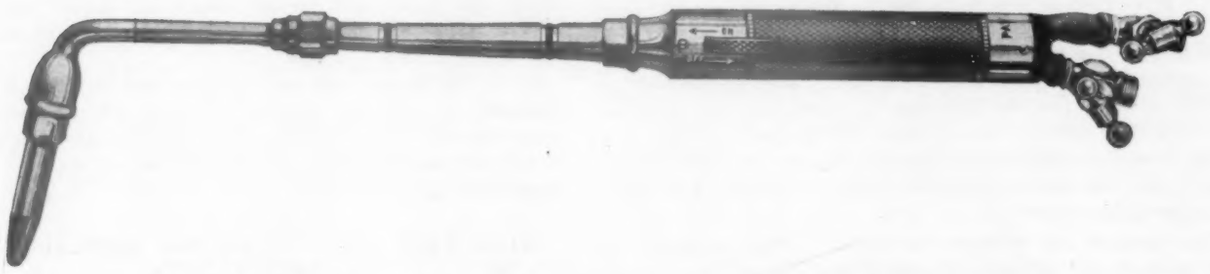
The use of spot welding in the metal trade industries has resulted in developing many practices which are perfectly satisfactory for the particular conditions and requirements at hand: but cannot be universally used. Following are some of the practices referred to:

To obviate indentations on both plates, a large flat die is used on one side and a small steel disk under the die on the other side. This steel disk is heated to a welding temperature and is forced

*Courtesy of The American Welding Society.

Announcing

New Improvement in Welding Torches



The object of this "Manufacturers Special" torch is to present an easy means of saving gas between welding operations. While primarily intended for manufacturers, it also strongly appeals to commercial welders.

A knurled thumb piece on the handle controls auxiliary valves which shut the oxygen and acetylene passages off consecutively, leaving a small pilot flame of acetylene only. A slight movement of the thumb restores the original flame immediately.

This torch is the result of four years development work. In actual installations, it has proved a saving ranging from 20 per cent to 40 per cent. In addition to the saving feature, a guaranteed mechanical check against "back-fire" is offered.

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into the plate, so filling up what would otherwise have been an indentation.

Another method is to use two large flat dies and put a steel disk between the plates and in line with the dies.

Two or three spot welds made at one operation by using one large flat die and a special die designed so as to produce equal pressure on all three spots.

Making welds at four or more points at one operation by the use of projections on one of the plates. Welds made in this manner are of variable quality and strength.

Welding a thin plate onto a thick plate by using a very pointed die against the thin plate and raising the voltage of the welding current so as to fuse the thin plate to thick plate. In this case, the thick plate does not become hot clear through, but there is a slight fusing on the surface directly opposite the pointed die. Such welds have not much strength, but are suitable for fastening a nameplate in place.

The standard spot welder is a vertical machine carrying two dies, or electrodes, one above the other, and intended to make one weld at a time; but many special welders, have been built, each for welding some special job. Portable spot welders have been built weighing from a few pounds up to several tons. Large special welders, making two welds at once, have been built for structural steel work, also large welders making several welds in quick succession.

The matter of dies or electrodes for spot welding is of great importance. The ideal die should be able to withstand over twenty thousand pounds per square inch of compression stress without distorting; it should be hard enough to resist wear from contact with the work; it should be a better conductor of electricity than copper; it should be a poor conductor of heat. The ideal die has not yet been constructed; up to the present hard rolled copper dies have been the best obtainable.

Die point area, amperes used and pressure used for spot welding are not fixed quantities; but on the contrary, vary widely in the practical application of the art, especially on material up to ⅛ in. thick; the die points have a diameter equal to the total thickness of the two plates to be welded; the current used is about 50,000 amps. per square inch of die point area; the pressure used is about 20,000 lbs. per square inch of the die point area. But even these figures will vary widely according to the stiffness of the plates, the distance between the welds, and the time required for making the welds.

SPECIAL CAR FOR THERMIT WELDING CREW

(*Continued from Page* 22)

possible to weld the year around except in extremely cold weather.

It might be well to enumerate below some of the savings which are made by the use this car:

1. Saving in molding sand and fire clay.
2. Saving in molds lost in freezing and rainy weather.
3. Saving in time of loading and transporting material.
4. Saving in material which previously had to be piled up on the street, where some of it was bound to be lost.
5. Saving in materials and tools from theft.
6. Saving in coke burned in salamanders, used for thawing out molding materials.
7. More joints can be made by the same number of men, because the materials for day and night shift are loaded into the car by the night crew between 9 o'clock, when they report for duty, and midnight, when the track is turned over to them for welding.
8. The wear and tear on the pre-heaters in loading them on trucks and unloading them was one thing which gave us much concern. All three of our pre-heaters are carried in the car and unloaded from the car on plank runways designed for that purpose.

Members of the welding crew are broken in as motormen, so that there is no additional expense for the operation of the car.

HOW STEEL GONDOLAS ARE DISMANTLED

(*Continued from Page* 24)

scrap dock yard, figure 5. In the center the crew is shown at work on the trucks which have been removed from the car bodies and at the left the car bodies are shown ready to be worked upon. Figure 6 is another view of the yard and shows how neatly the place is kept.

Up to the present time 481 of these steel gondolas have been dismantled at Eola and there is no reason why the dismantling, scrapping and salvaging of the remainder of these steel gondolas should not be carried on as profitably as for the 481 already disposed of.

ELECTRIC ARC WELDING APPLIED TO SHIPBUILDING

(*Continued from Page* 32)

ports to hold the keel plate in position for welding are attached every 8 to 12 feet depending upon the length of the section of keel to be supported. The supports are made of 2-inch by 4-inch timber and secured against the shell at ¼ inch below the centerline of the keel and braced from below by a second 2-inch by 4-inch. The keel plate of 20-pound steel prepared in the shop from templets is placed on the supports against the shell and secured by a spike. In case of irregularities or a lap in the shell plate, the keel plate is placed against the steel, a line scribed on it conforming to the contour of the shell, and the edge trimmed to fit with an acetylene torch. When the plate is secured in place tack welds are put in at one-foot intervals securing the keel plates on both sides to the shell. As soon as the tacks are made the supports are knocked out and a full fillet weld is put in, the work being done in two or three layers. The individual sections are joined with plain butt joints.

In this way a bilge keel can be installed without the use of angles or rivets; no shell plate is pierced and hence there are no tanks to be tested. On a ship requiring 344 feet of bilge keel on each side an installation was made in 9½ working days requiring 97⅝ welder man-days. One thousand three hundred and seventy-six linear feet of fillet weld and 41 feet of butt welds were made using 1,710 pounds of 5/32-inch welding wire. This job was done at a cost of $3,900 as compared with $8,000, the approximate cost of attaching a duplicate keel by riveting.

STEEL TREATERS TO FEATURE INDUSTRIAL GAS

Representatives of the steel industry in all the leading manufacturing countries of the world attended the International Steel Exposition on the Commonwealth Pier in Boston this month, which was to be one of the features of the annual convention of the American Society for Steel Treating, held in that city, September 22-26.

The manufactured gas industry played an important part both in the exposition and in the convention itself, and the steel men were given many opportunities to see and examine the latest developments in the art of steel treating by gas, a function of the industry which is growing by leaps and bounds.

The American Gas Association, with the co-operation of the industrial gas engineers of New England, was among the leading exhibitors at the exposition, as were a number of leading gas appliance manufacturers, most of whom are members of the association. So important was this feature that the Boston Consolidated Gas Company ran a pipe line for two miles in order to get sufficient capacity to the building to take care of the various exhibits showing the use of gas for industrial purposes.

The booths of the American Gas Association were in charge of Mr. A. Gordon King, service engineer from A. G. A. Headquarters in New York. Other exhibits of special interest to gas men were the booths of the Combustion Utilities Corporation,

Surface Combustion Company, the American Gas Furnace Company, A. H. Wolff Gas Radiator Company, Boston Consolidated Gas Company, Armstrong Cork & Insulation Company, Republic Flow Meters Company, the Bristol Company, Industrial Gas Equipment Company, Bellevue Industrial Furnace Company, New England Association of Gas Engineers, and the W. S. Rockwell Company.

During the convention Mr. H. O. Loebell, of the Combustion Utilities Corporation, read a paper on "Improving Quality Standards and Lowering Production Costs of Heat Treated Steel." Mr. J. A. Doyle, of W. S. Rockwell Company, will speak on "The Selection of Fuel for the Heat Treatment of Metal."

PUNCH PRESSING ENGAGEMENT

Second Break in Large Punch Press Did Not Run Through Old Weld—How This Job Was Done

By J. F. Irby*

Every shop in the country working with metal may not have among its equipment a punch press of such dimensions as the one illustrated here. Still there are few shop owners that are not faced, at one time or another, with the spectre of a shut-

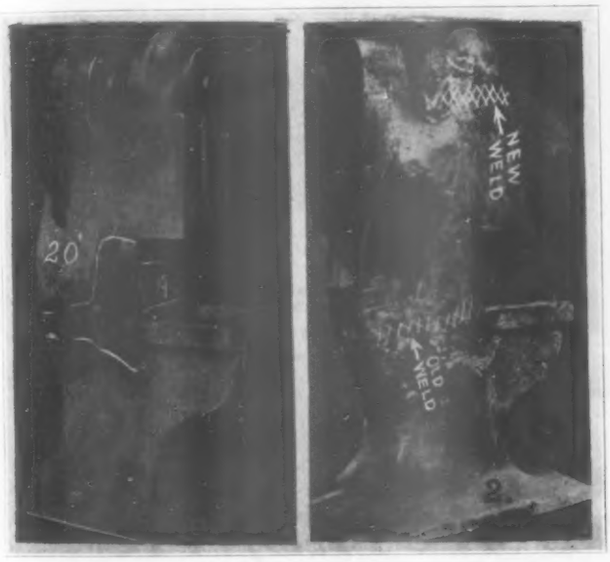

Fig. 1—Shows Location of Old Break. Fig. 2—Shows Location of New and Old Welds.

down because of damaged machinery. Thus the main point in the following incident should be interesting as typical of the wide variety of repair and reclamation work done by welding.

We may start with the statement that when broken equipment is carefully repaired with a reinforced oxy-acetylene weld it is stronger at the repaired section than it was originally. Some skeptics might say, "Yes, probably," or "Undoubtedly, in a laboratory test, but does the same hold good in practice?"

It does! But to answer it most satisfactorily is to prove it.

Fig. 1 shows a punch press frame, a gray iron casting weighing approximately two tons. A piece of metal too thick or tough broke the casting square off at the level of the table. The frame was cracked through a hollow rectangular section 19 in. wide by 20 in. deep, 6 in. thick at front, 1½ in. at the back and 2 in. thick at sides.

After the edges were carefully veed and the frame accurately aligned, it was preheated by gas burners and a good welding job done by competent oxy-acetylene operators. The casting was carefully covered to protect it from any draughts during welding, and this covering was left in place until the casting had cooled.

After this proper annealing the punch press frame was put back in service and stood up under the work for a year. Then some one again fed it too big a bite and the frame broke. Of course the frame was sent to the same shop which had welded it after the first accident. It was repaired and is shown in the second illustration ready for another term of service.

The point in this story is not that one good job deserves another, nor that the competent welder is an ever-ready help in time of trouble, but that the second break did not run through the old weld. This was left unharmed. Nor was the new break in the region preheated for the old weld. It was in the crank bearing 4 feet away. This then demonstrates the original proposition, that a second break in a properly made weld need never be feared.

*All Metals Welding Mfg. Co., Baltimore, Md.

FALL MEETING OF AMERICAN WELDING SOCIETY TO BE HELD IN CLEVELAND

The Fall Meeting of the American Welding Society will be held this year in Cleveland, on October 30 and 31, Hotel Winton as headquarters. Strenuous efforts are being made by the Meetings & Papers Committee to make this meeting one of the outstanding accomplishments of the American Welding Society. Members are promised a program both interesting and profitable.

The technical session will be held Friday morning and will be devoted to a number of papers on the general subject of applications of welding in the construction of bridges, buildings, etc. In order to bring about this extension a great deal of information is needed which will require elaborate and costly investigations. Not only will it be necessary to summarize in usable form results attained in service where welding has already been used in the construction of buildings and bridges, but it will also be necessary to furnish engineers, designers and draftsmen with accurate data as to costs, methods to be used and engineering data as to types of joints, strength to be expected, factors of safety, etc. Moreover, it will be necessary to convince legislators that welding is safe and adequate for the purpose intended. All of this requires data that does not now exist and it is the intention of the American Bureau of Welding to secure this information at a minimum cost to the industry and in such a way that it will be recognized as authoritative. The problem of the Bureau does not end even here, as it will then be necessary to show engineers and contractors how to go about the adjusting of their fabricating and shop methods so that the work can be satisfactorily and economically performed.

For the purpose of bringing to the attention of the members the importance of this work and its possibilities, the Meetings & Papers Committee has decided to devote the technical session of the full meeting to this general subject. It is anticipated that a number of prominent guests, including some of the leading structural engineers of the country, will be present at this meeting.

In order to give everyone an insight into what transpires at a meeting of the Board of Directors of the Society, what subjects are taken up, how they are discussed, the Board of Directors will hold a meeting on Friday afternoon which will be open to all members of the Society. It is intended at this meeting to outline plans for further activities and increasing membership. Later in the afternoon the meetings and paper committee will hold a meeting with the chairmen and secretaries of the various sections in order to lay plans for bringing about better monthly section meetings.

WELDING BEATER SHAFT FOR PAPER MILL

By A. W. Young

A cast-iron shaft about 14 feet and 9 inches thick was broken on the side opposite the beater. Beater shafts are oblong tanks with rounded ends. They are about 4 feet deep on the front side and deeper on the back half where the shaft and beater revolve. These beaters are used for various processes to which the pulp stock must be subjected before going to the paper-making machines. The shaft end bearings were about 16 inches long, so designed with the view of aiding the molding

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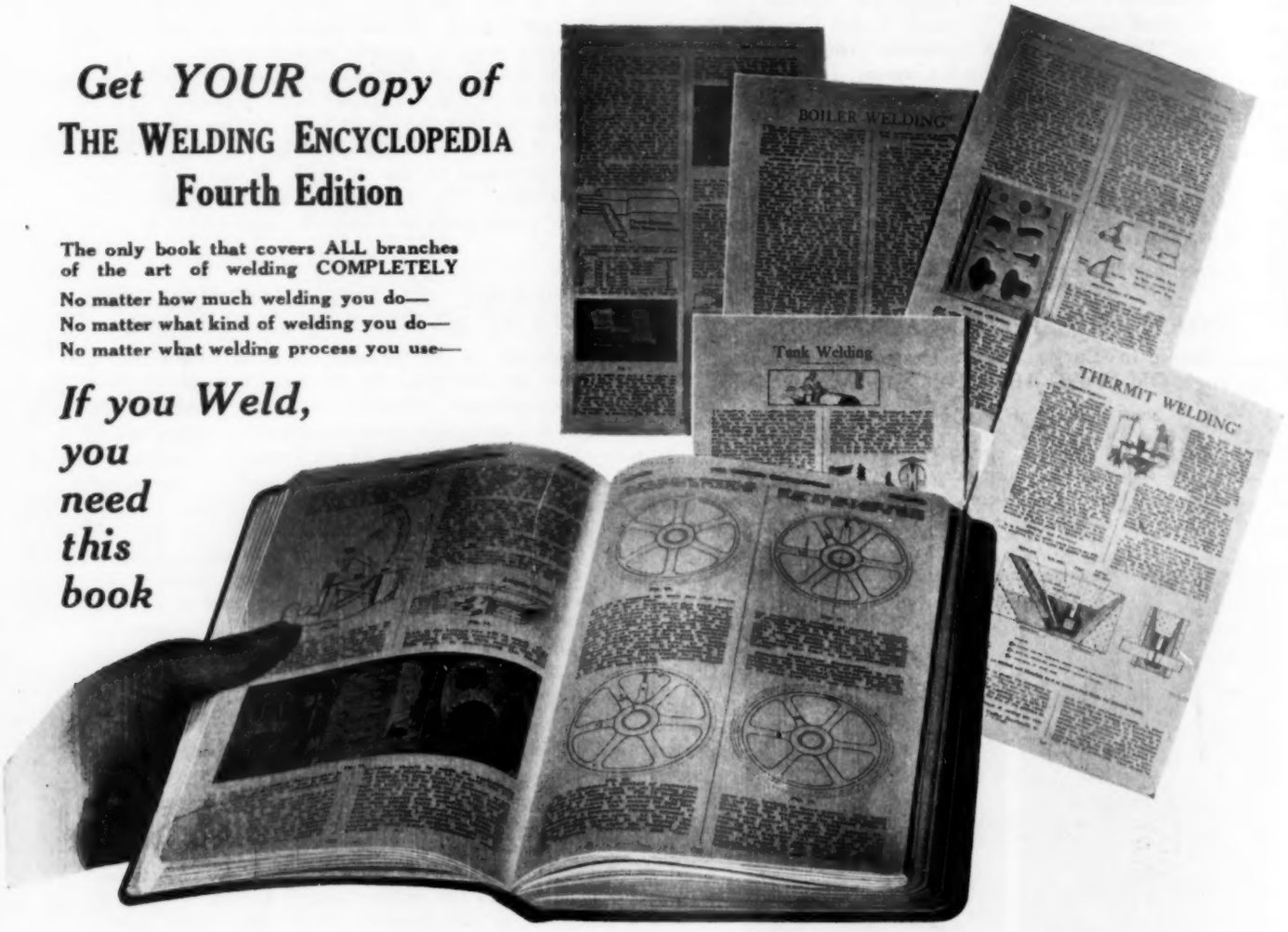

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It serves every possible need for information on all of the welding processes. Whether your shop is engaged in production welding or repair welding, or both, whether you use the processes for only one metal or for a variety of different metals and different types of joints, **The Welding Encyclopedia** furnishes you with expert advice which pays for itself by increasing the quality of your work. **The Welding Encyclopedia** is not restricted to the welding knowledge that can be imparted by a single writer. On the contrary, each subject is discussed by a recognized authority on that particular subject. About fifty of the best known authorities on welding subjects in the world have contributed the results of their experience and research along special lines.

In compiling **The Welding Encyclopedia** the editors have had put at their disposal a vast fund of information which could not be made available through any other source. The result is a single volume covering the entire range of problems which can arise in the application of any of the welding processes, and this information has been so carefully arranged and cross-indexed that any portion of it is instantly located.

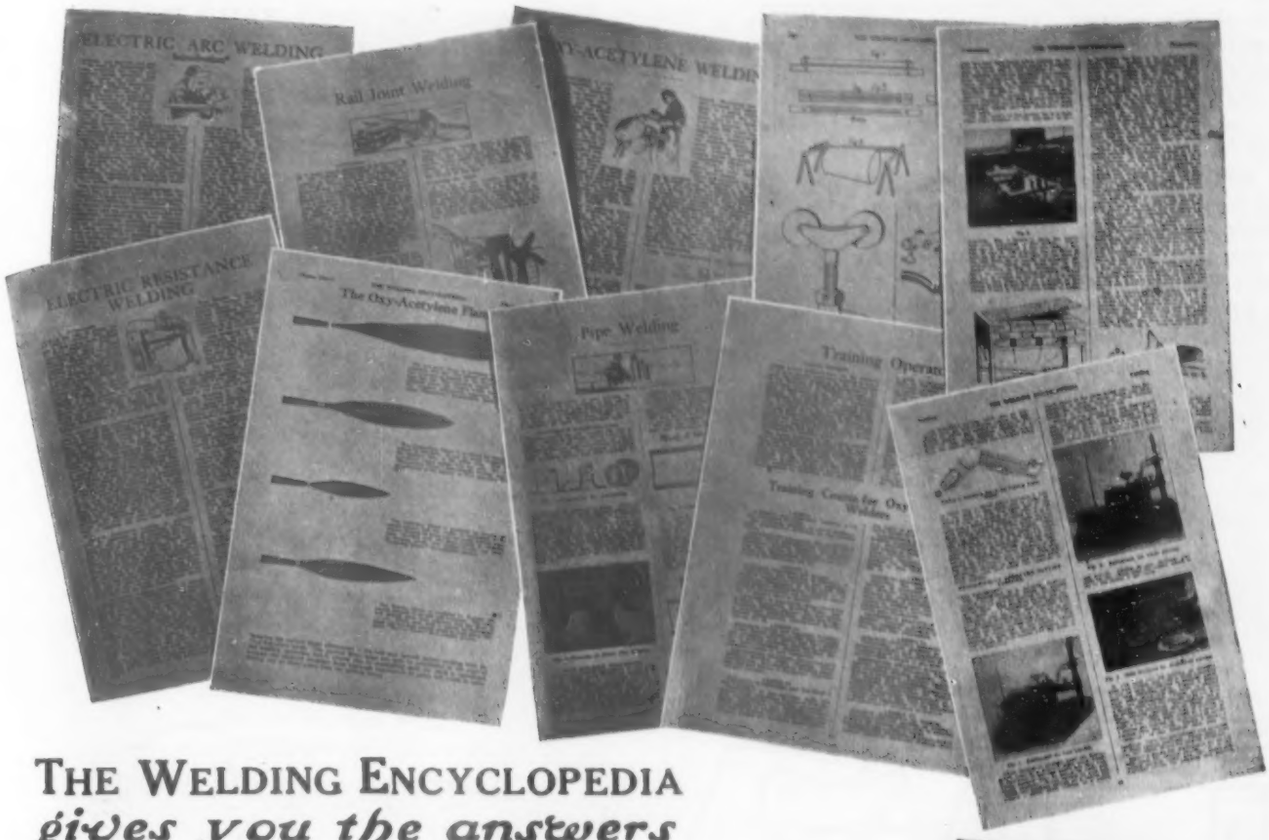
The Welding Encyclopedia describes in detail the theory and practice of every welding process, and tells how to weld every weldable metal by each of these processes, giving detailed instructions for handling such important welding jobs as boiler welding, sheet metal welding, tank welding, pipe welding, automobile welding, cutting, rail joint welding, railroad welding, etc.

It tells how to prepare parts for welding, how to preheat, how to anneal, how to test welds and how to select welding material. It explains the meaning of all words and terms found in welding literature. It gives the trade names of all products used in the welding industry, giving the name and address of the manufacturer in each case.

It tells how to take care of welding equipment so as to get the best results from it and keep maintenance costs down. It gives the latest revised federal, state and insurance rules and regulations for the installation of welding equipment, and its application to important work. There is also a splendid collection of charts and tables used for welding information, grouped together for convenient reference.

A valuable feature of The Welding Encyclopedia is the chapter on the training of operators. This chapter outlines lessons, exercises and examinations for a complete course in both oxy-acetylene and electric arc welding. Throughout these instruction courses references are supplied to the instructor and student so that they may find instantly the portions of the text which cover the topics in the outline.

The text is profusely illustrated with photographs and drawings made especially for **The Welding Encyclopedia**. No detail has been overlooked which could make The Welding Encyclopedia more complete and practical.



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The editorial office of The Welding Engineer is recognized as the headquarters for authoritative information and help on all branches of welding, and conducts a large volume of correspondence helping welders and welding departments out of their difficulties. In a period of eight months it was found that 95% of the problems submitted to this office were answered directly from the pages of The Welding Encyclopedia.

Think of the time all these welders would have saved by providing themselves with a copy of The Welding Encyclopedia in advance! Don't wait until you get into trouble, or run up against a hard welding problem, but get the information in your hands now. Then, when you want it, it will be instantly available.

Whatever your troubles may be, you will find that The Welding Encyclopedia furnishes expert advice and instruction.

The table of contents below can give you only a very general idea of the scope of this work. Send for the book and give it a careful examination. We guarantee that it will be fully satisfactory and if not we will cheerfully make a refund. Send the coupon today.

CONTENTS

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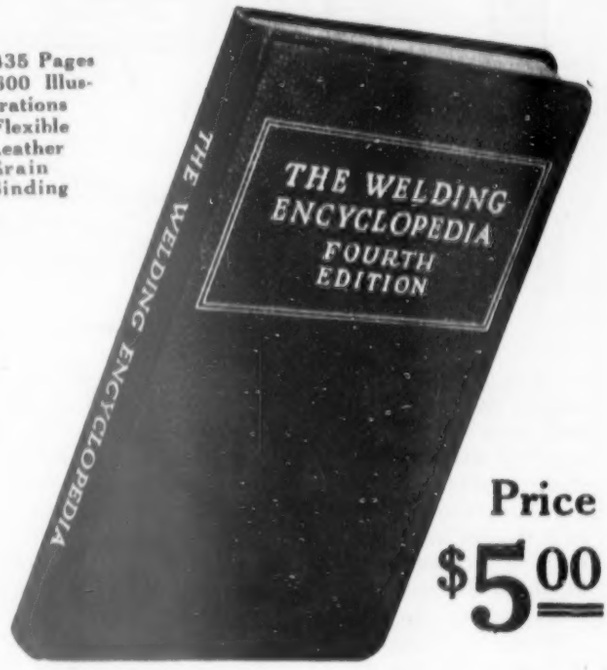

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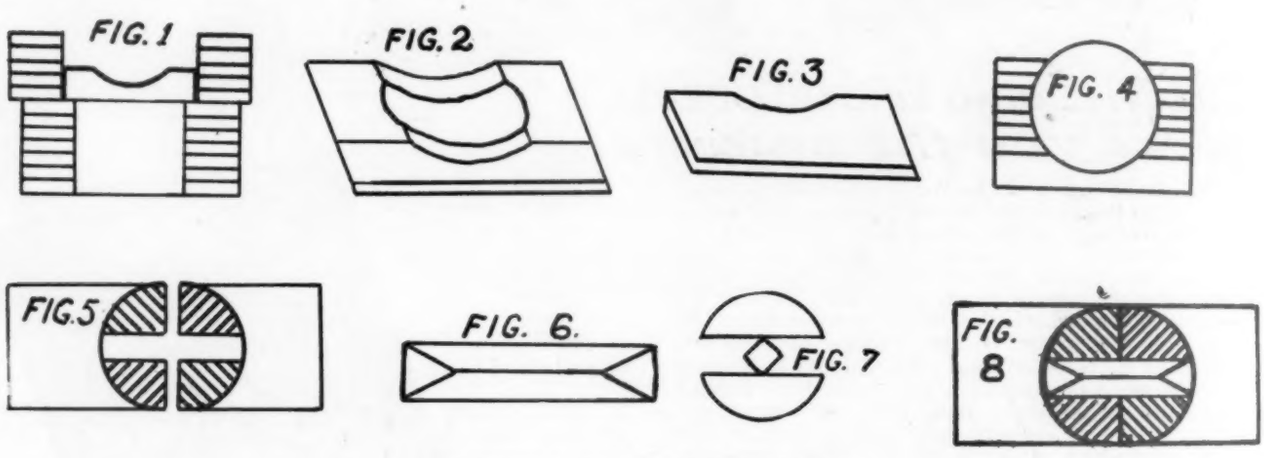
of the shaft in position. The broken ends were lined up by "V" blocks on top of jacks set back far enough to allow a small deep furnace in between.

The furnace was built up to a point 3 inches below the bottom of the shaft at which point the rest of the brick was set out 1½ inches for the purpose of forming an inside ledge. (Figure 1.)

A slab of carbon was cut to rest on this ledge and a heavy layer of welders' molding compound was put on top of the block in concave shape. The shaft was then pressed into this layer for the purpose of getting the imprint of the circle in the outside edges. The center was dug out so as to allow an extra thickness for the weld. The retaining walls on each side were about 1 inch thick fitted up snugly to the shaft. (Figure 2.)

It was necessary that the furnace should be long enough so that the head of the shaft could rest on the ledge in order to prevent obstructing the furnace heat which should come directly to the shaft. It was slid over in place when ready for the welding. The next step was to level down the projecting top ends with the molding compound so that the riser retaining walls made of carbon blocks lay flat.

Figure 4 shows a cross-section of the shaft with the bottom retainer and carbon blocks laid on as the filling progressed. The furnace was deep enough so that 6 inches of charcoal could be put in and 6 inches of coal on top of that, with 3 inches of space still in the bottom of the shaft. Up to this point the furnace was



Operations in the Welding of Beater Shaft

to be built no higher. The next step was to prepare the broken ends of the shaft. A piece of boiler plate was glazed with dried sand about an inch thick and was placed on top of the furnace under the shaft. This formed a catch basin for the falling metal while the shaft was being cut in perpendicular "V" form.

The shaft was then turned half over and a 2-inch slot was cut in it the full length of the "V." The shaft was turned back to the first position. A block of raw iron 2 inches square, the length of the slot, was wedged into the slot. This block was beveled to the edge on both sides. (Figures 6 and 7.)

As the block touched the slot on the corners the boiler plate with the melted iron was removed. The bottom retainer was laid on the ledge. The shaft was lined up and the end bearings bolted down. There was enough end play to allow for contraction. The furnace was built up level with the top of the shaft and a lid of sheet asbestos was put on. When the shaft was at the highest possible peak the lid was removed and several tiers of brick at the point of the weld. It was then slid over under the retainer which by this time was baked hard. Everything was now ready for the welding. This was a two-man job, as both sides had to be filled at the same time, with a helper to place the carbon block retainers as the filling progressed to the top. When the weld was completed the furnace was filled with ashes or dry sand, built high on top of the shaft which tended to equalize the cooling off. It is always safer to allow the shaft to become cold before removing the furnace.

ARC WELDING HAND BOOK

Arc Welding Hand Book, by C. J. Holslag, Chief Engineer of the Electric Arc Welding & Cutting Company, is a 243-page book on electric arc welding and cutting. The dimensions of this book are 3¼ inches to 7½ inches and the price is $2.00. It is published by the McGraw-Hill Company, Inc., New York City. This book describes in detail the methods used in arc welding. The description is written in a clear, easily read manner and gives the use of equipment and electric welding process so that the newer applications of this branch of welding are easily understood. It serves as a welding text book for welding operators and supervisors.

This book takes up different types of welding, giving instructions as to the formation of beads, covers spreading welding, overhead welding, padding welding, fillet welding, lap welding, butt welding, etc. It has a special section giving the different specific applications of arc welding. It serves as a practical guide to the modern uses of welding, and should be helpful and interesting to all engaged in the welding field.

News of the Welding Trade

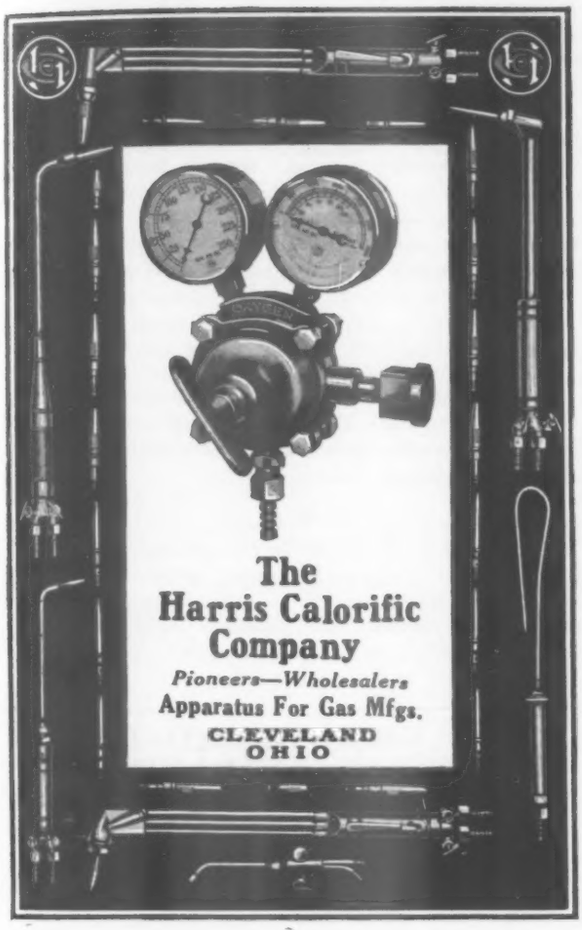
Mr. E. R. Chinberg, electrical supervisor of the Chicago, Rock Island & Pacific Railway, has resigned to take the management of the West Gate Welding & Electric Supply Company, of San Francisco, Cal., a newly organized company dealing in electric welding apparatus and supplies.

They have the California distribution of the complete line of U. S. L. electric arc welders manufactured by the U. S. Light & Heat Corporation, Niagara Falls; the Western distribution of the Wanamaker Coated Electrodes, manufactured by the International Welding Engineering Corporation, Chicago, Ill., and the Tecor welding accessories manufacured by the Transportation Engineering Corporation of New York City.

Mr. Chinberg began his electrical and welding career in 1907 when he entered the employ of the Goodland Light & Power Company, Goodland, Kans. He began his services with the Chicago, Rock Island & Pacific Railway in 1910, and through successive promotions was appointed electrical supervisor in 1917. He was associated with Mr. Wanamaker, electrical engineer, in the electrical and electric welding development on that railroad until last April, when he resigned to take over his new duties.

The sales office of the newly organized company is at 18 Front Street, San Francisco, Cal.

The Travelers' Insurance Company of Hartford, Conn., have recently issued "Group," a 26 page catalogue outlining to industrial firms and employers the advantages of group insurance. The booklet outlines the company's policies and in addition contains several testimonial letters from executives throughout the country, commending the plan.



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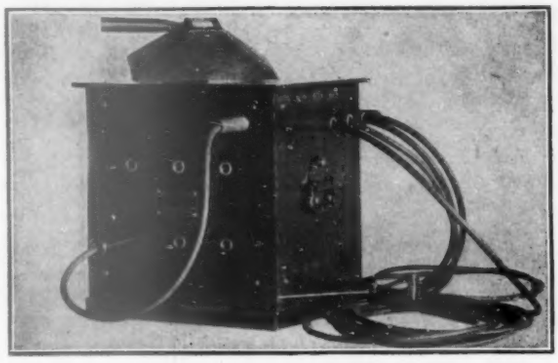

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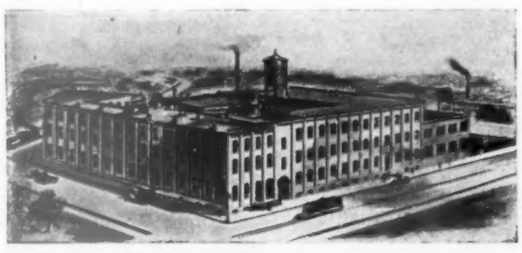

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The John A. Roebling Sons Co, Trenton, N. J., manufacturer of wire rope, cables, etc., has plans under way for a two-story factory and distributing branch, 200 x 400 ft., at San Francisco estimated to cost $200,000 with equipment, for its Pacific Coast branch, known as the John A. Roebling Sons Co. of California, 646 Folsom Street, San Francisco. Frederick W. Quandt, Humboldt Bank Building, San Francisco, is architect.

The Central Welding Co., Lansing, Mich., has moved into its new plant at Turner and Howard Streets.

H. D. Rohman, of the R. C. S. Equipment Co., New York, has taken over the agency of the Electric Arc Cutting & Welding Co., Newark, N. J., for Taperod electrodes on interstate steam railways.

The Thrall Electric Company, Presidente Zayes No. 27 & Esquina A Habana, Havana, Cuba, has just been appointed the exclusive representative in the Island of Cuba for the Roller-Smith Company, 233 Broadway, New York City. This company is primarily a sales and engineering organization carrying complete stocks of electrical machinery, instruments and supplies, and maintains a very large electrical installation department. The following firms are exclusively represented by this company in Cuba: Roller-Smith Co., Allis-Chalmers Mfg. Co., Kinney Mfg. Co., Robbins & Meyers Co., Atlantic Insulated Wire & Cable Co., Philips Glowlampworks, Ilg Electrical Ventilating Co., Shelton Electric Co., Trumbull Electric Mfg. Co., Appleton Electric Co., Brunner Mfg. Co., Badger Fire Extinguisher Co., Brunswick-Kroeschell Co., Federal Telephone & Telegraph Co., Wilson Welder Co. and Kohler Co.

The General Electric Company has just issued a 12 page booklet describing the new type A G-E Welding Electrode. This little booklet is handsomely illustrated and contains very valuable information and data for using the electrode. Details are given on construction and characteristics. Results of tests on welded cast iron specimens and deposited metal specimens are described. Ocillograms demonstrating arc stability are reproduced, tables of specifications of standard sizes are given and comprehensive instructions for the proper manipulation of the electrode are supplied.

A meeting of the Administrative Board of the American Engineering Council has been called for October 17 and 18 in Chicago. The board will convene at the headquarters of the Western Society of Engineers, President James Hartness presiding.

Classified Ads

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Position Wanted—Acetylene welder of nine years' experience desires to make a change. Capable of acting as foreman in welding shop. Also will consider connection with welding supply concern. Address A. W. Young, 811 Trimble Ave., Kalamazoo, Mich.

Wanted—Experienced compressed acetylene plant operator. Give full particulars, including experience, in answering. Address 36, care The Welding Engineer.

Salesman—An experienced man is wanted to act as salesman and demonstrator for well established firm. Must be able to handle the torch and the electric-arc. Address 33 care *The Welding Engineer.*

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Wanted—Arc welders for work in Mississippi. Must have knowledge of handling various alloy electrodes. Also of cast iron welding. Applicants with knowledge of oxy-acetylene welding also will receive first consideration. Apply in own handwriting, giving full particulars and references. Address 35, care The Welding Engineer.

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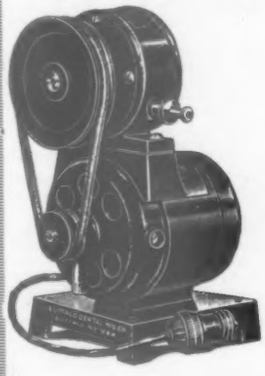

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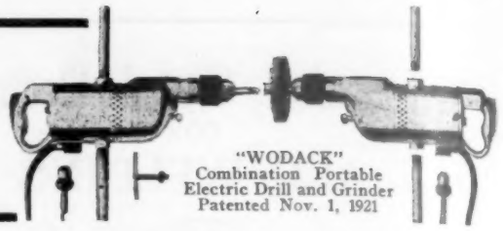

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CURRENT WELDING LITERATURE

ANNEALING STEEL CASTINGS, by H. A. Neel.—Content of this article is that of a paper presented at the convention of the Electric Steel Founders Research Group. It lists as to the benefits to steel casting from annealing, 1. Increased physical properties; 2. The increase of strength, set up and cooling in any welding operation; 3. Increased machinability.—Railway Purchases and Stores, October, 1924.

WELDING KEPT THE CANNERY RUNNING.—An instance in which a badly broken cast iron pulley was successfully welded. This pulley, 48 inches in diameter, used a 25 horsepower engine and broke through four spokes during the height of the season. To install a new wheel necessitated an expense of $1,000 plus the loss of valuable time. The service operator was called and the job of welding the breaks was started. The article describes in detail the operation, including veeing out the breaks on both sides, heating, and the actual weld. Figures are listed to show the cash saving of $875.00 plus the value of continuous operation for approximately sixty days.—Oxy-Acetylene Tips, October, 1924.

DOUBLE WELD ON THE STERN FRAMES OF THE WEST JAPPA, by J. L. Sendner.—An account of the successful welding on the stern frame of the U. S. Shipping Board Ship West Jappa. Work performed by the Ferrofix Brazing Co. of Seattle, Wash., in dry dock of the Todd Company's Plant. A detailed description of the work which was completed in five days.—Reactions, Metal & Thermit Corp., Third Isue, 1924.

WELDING HIGH SPEED STEEL, by S. W. Miller.—Containing data furnished by the American Bureau of Welding in connection with the information service. The article is a discussion of the welding qualities of high speed steel and its adaptability for producing welding rods. The necessity of dissolving carbides in the iron before high speed steel can have any value for cutting metals. High temperature required for such solution.—Journal of The American Welding Society, September, 1924.

ELECTRIC SPOT WELDING ALUMINUM OR DURALUMIN, by J. W. Meadowcroft.—The article contains the author's experience in uniting pieces of sheet metal by means of a series of separate spot welds. The use of steel as a resistance material and the interposition of superposed pieces of aluminum or duralumin between sheets of steel.—Journal of the American Welding Society, September, 1924.

OXY-ACETYLENE CUTTING AND WELDING FOR STUDENTS.—The first of a series of lectures published by the Acetylene Journal as instruction to beginners. The article deals with the use of the blacksmith's forge, the air blast, fuels and combustibles, the study of heat and temperature, oxygen the supporter of combustion, conditions required for perfect combustion, proper manipulation of the torch, and regulation of the flame.—Acetylene Journal, October, 1924.

WELDING RAILS IN BROOKLYN.—The article describes the extent to which thermit welding has been applied to the building and repairing of tracks by the Brooklyn-Manhattan Transit Co. since 1923. Satisfaction with this type of welding has caused the transit corporation to favor it over cast welding, although that type has not been completely abandoned. The article illustrates the simplicity and capability of apparatus used in the newer type of welding, as well as the fact that smaller and more easily controlled gangs may do the work.—Reactions, Metal & Thermit Corp., Third Issue, 1924.

SUCCESSFUL WELDING OF CAST IRON BOILER SECTION.—A description of how the top section of a hot water boiler was welded by the Chicago Oxy-Acetylene Corporation. It was a used boiler section but had been out of service some time. Description of the setting of the castings and the process of preheating prior to the weld. Particular detail given to the proper method of furnace construction to insure complete heating of the castings.—Acetylene Journal, October, 1924.

FABRICATING SPECIAL EQUIPMENT.—An article dealing with the extension in one plant of the welding process to the production of all welded products. Work in this plant ranges from brazing of ¼-inch copper tube to construction of reaction chambers holding two hundred pounds of material. The range of this production is divided into two classes, steel plate and pipe fabrication and copper work. The article describes minutely the different methods employed in this plant from the brazing of brass fittings to copper tubing, tinning, aligning, and welding copped coils, and the special equipment for such work.—Oxy-Acetylene Tips, October, 1924.

CONSERVATION AND RECLAMATION, by E. Wannamaker.—An article dealing with the reclamation work done by the Chicago, Rock Island & Pacific R. R. Outlines the departmental cooperation in this work and necessary electrical equipment. The article deals with the general subject of repair and conservation on railroads, no small part of which is electric welding. Cylinders are welded with the electric arc as are truck frames. In conclusion the article stresses the tremendous savings acruing from use of the electrical process.—Railway Purchases and Stores, October, 1924.

THE WELDING OF CAST IRON FROM A METALLURGICAL POINT OF VIEW, by J. G. Pearce.—A lecture delivered to the British Acetylene and Welding Association. London, April, 1924. Analysis of white and gray irons with portions of carbon, graphite, silicon, manganese, phosphorous and sulphur. The condition of the carbon determining whether iron is gray or white. Effect of sudden cooling on each type. Suitability of different compositions for castings. The effects of preponderance of different elements in iron. The study of the influence of constitution on properties and on the welding process. The article gives attention to the factor of expansion and shrinkage in the different compositions. Temperatures for welding joints of the different types given. Attention is also given to the welding of special irons.—Acetylene Journal, October, 1924.

OXY-ACETYLENE WELDING OF NON-FERROUS METALS, by Albert S. Kinzie.—A reprint of paper presented before May 1924 meeting of the Boston Section of the American Welding Society. An intensive study of the practical metallurgy of non-ferrous metals. A grouping and differentiating of ferrous and non-ferrous metals. The article takes up in detail the melting of copper, hardening and annealing of copper, conductivity of copper, granular structure of copper and copper plate; composition of brass, rolled and drawn brass, cast brass, alloys of brass, zinc in brass; machinery produced Tobin bronze and manganese bronze.—Acetylene Journal, October, 1924. Note: Article to be continued in future issues.

ELECTRIC ARC WELDING AS APPLIED TO JOINTS OF HIGH PRESSURE STEAM LINES, by A. Churchward.—An account of the installation of 14-inch high steam main of the Erie Lighting Company. Work performed by the American District Steam Company in 1919. Job consisted of extending the main from a new power plant over a distance of some two thousand feet to an older plant. Sleeves of this main were arc welded and machined down to actual size after having been tested at hydraulic presure of five hundred pounds. The job was commenced in the Fall of 1919, not completed until about February, 1920. The welding work done under most severe winter conditions.—Journal of The American Welding Society, September, 1924.

RECLAMING AND SCRAPPING STEEL FREIGHT CARS BY THE ELECTRIC ARC PROCESS, by A. M. Candy.—The article describes the methods employed by the Pennsylvania Railroad in cutting and dismantling cars. These cars are cut with the electric arc after which they are smashed with a skull cracker. Rivets are burned out with the arc. The article gives comparative costs of cutting by the arc, hand cutting with air hammers, and cutting by the oxy-acetylene process.—Railway Purchases and Stores, October, 1924.

OXY-ACETYLENE WELDING AND CUTTING FOR THE PLUMBING AND HEATING CONTRACTORS, by H. E. Wetzell. An article dealing with the extension of oxy-acetylene process in the field of plumbing and heating installation. A consideration of the factors which render oxy-acetylene cutting advantageous to such operations. Fabrications may be made on the job. The elimination of error is made possible and accurate fittings insured. Consideration of cost of welded fittings as compared to other types. Article contains several specific instances where oxy-acetylene welding has been used with satisfaction in the completing of plumbing and heating fixtures.—Journal of The American Welding Society, September, 1924.

BRONZE WELDING IN THE LOCOMOTIVE REPAIR SHOP, by James S. Heaton.—Study of the welding of castings in railroad repair shops with a special view of the part Tobin bronze has recently come to play. Description of such welding on air pumps, smoke stacks and other equipment. The majority of these jobs were welded without removing the parts from their proper settings, and without dismantling of any kind. A study of the saving in time realized in bronze welding for such repairs and ease with which cast iron welder may be trained in handling Tobin bronze.—Acetylene Journal, October, 1924.

WELDING TANKS BY THE OXY-ACETYLENE PROCESS—An article describing the welding of storage tanks divided into four classifications: (a) a light sheet metal group consisting of tanks and containers built lighter than ten gauge material; (b) the large storage tank and gas holder group; (c) the pressure tank group; (d) the large group consisting of small tanks used for general purposes. The article takes up in detail the consideration and selection of suitable sheet for these different classes and the type of welding best suited for each.—Acetylene & Welding Journal, September, London.

RESISTANCE WELDING TRANSFORMERS—A consideration of composed standards for resistance welding transformers including modifications made by the main committee on resistance welding of the American Bureau of Welding. These standards include continuous and intermittent rating classification of insulating materials, method of loading transformers in temperature tests, electrical output, power factor, voltage and insulation and efficiency.—Acetylene & Welding Journal, September, London.

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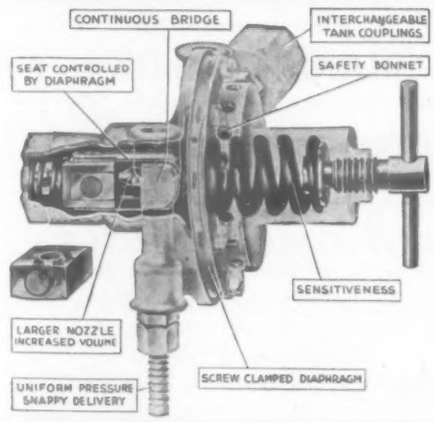

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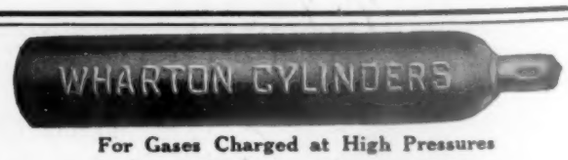

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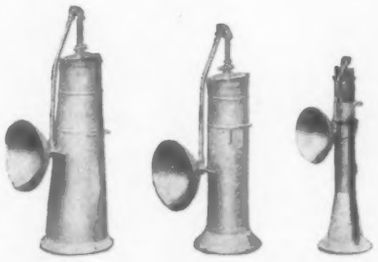

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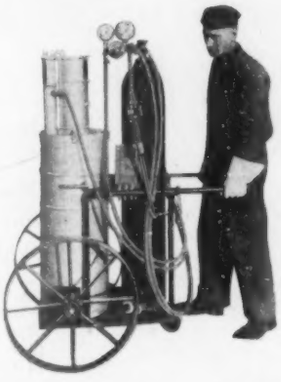

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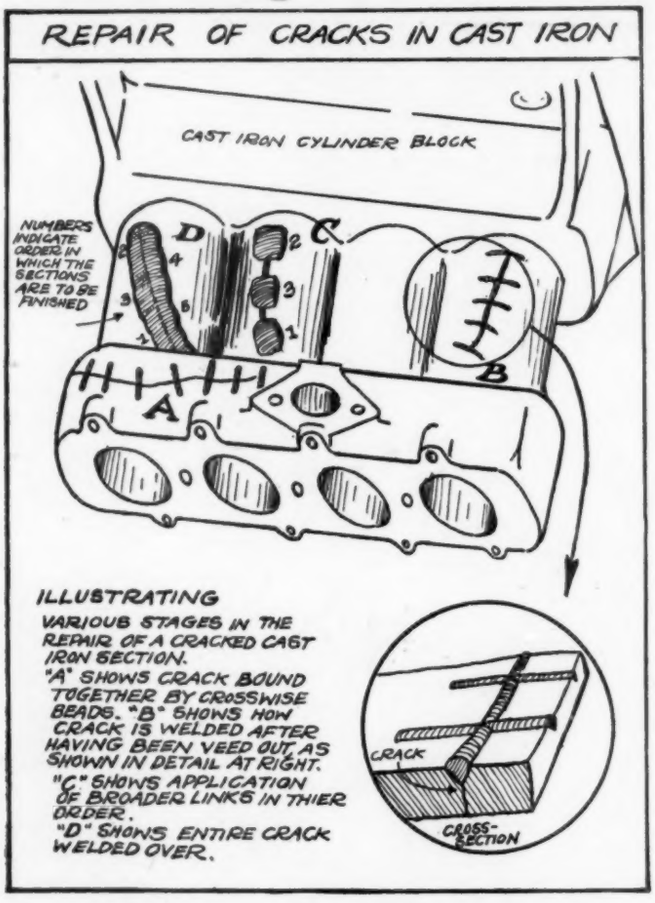
REPAIR OF CRACKS IN CAST IRON
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NUMBERS INDICATE ORDER IN WHICH THE SECTIONS ARE TO BE FINISHED
A
B
C
D
ILLUSTRATING
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"A" SHOWS CRACK BOUND TOGETHER BY CROSSWISE BEADS. "B" SHOWS HOW CRACK IS WELDED AFTER HAVING BEEN VEED OUT AS SHOWN IN DETAIL AT RIGHT.
"C" SHOWS APPLICATION OF BROADER LINKS IN THIER ORDER.
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CRACK
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Chapter XX *Pages 180 to 190*

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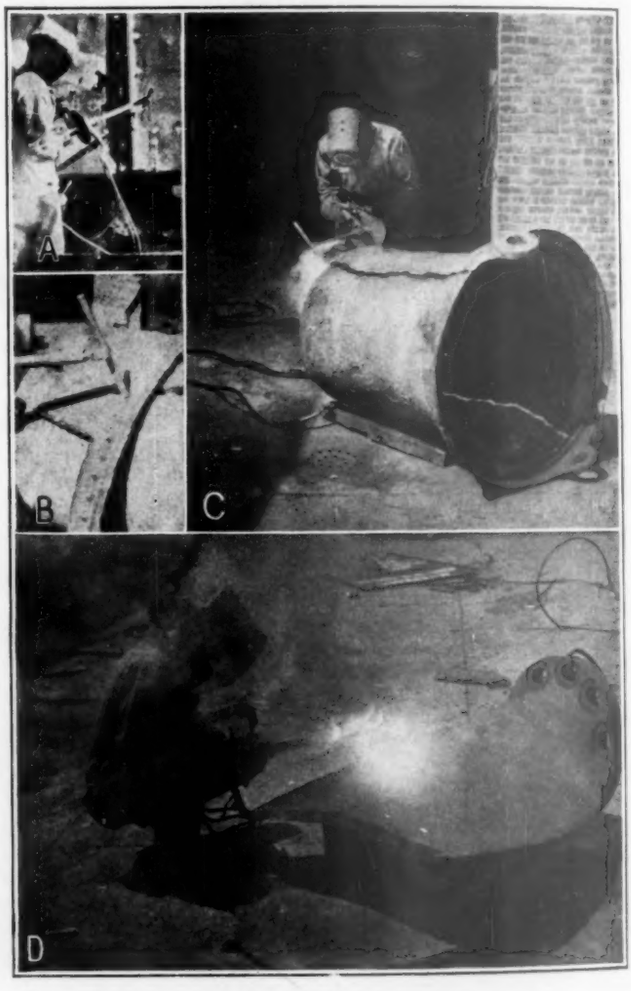

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